THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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	Page
British Manufacturers and the Carriage Problem	845
The Mobilisation of Science	846
Professional Conduct	846
Lead	847
Trade with "Neutrals"	847
War and Quackery	847
Battery-Bell Signalling Systems in Mines (*continued*) ...	848
New Electrical Devices, Fittings and Plant (*illus.*)	849
Correspondence—	
The Telephone as Nursemaid	850
Cab Signalling	850
Electrical Industry in Belgium	850
Polish Refugee Students	850
Legal	850
War Items	852
The Practical Result of the Point Five Tariff, by A. S. Blackman and T. Roles	853
A Battery Amalgamation	855
Business Notes	855
Notes	860
Reviews	860
City Notes	864
Stocks and Shares	867
Share List of Electrical Companies	868
Electricity in Farming.—III. (*illus.*)	869
Economic Operation of Electric Ovens, by P. W. Gumaer (*illus.*)	871
The Report of the Ontario Hydro-Electric Commission (*illus.*)	873
New Patents Applied for, 1915	876
Abstracts of Published Specifications	876
Contractors' Column ... ... Advertisement page xviii	

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BRITISH MANUFACTURERS AND THE CARRIAGE PROBLEM.

IN view of the much discussed problem of the capturing of German trade and the cultivation of a higher standard of efficiency with which to combat the keener competition expected from Germany after the war, manufacturers and others interested in this question are regarding with no small concern the ever-increasing menace to trade caused by the carriage problem in this country at the present time.

At no period in the history of railways in this country do the interests of the trader appear to have received the careful attention they deserve. On the contrary, the attitude of the railway and shipping companies towards the development of trade has been for the most part selfish and antagonistic in effect. Whereas in Germany the question of freight charges is one of the minor considerations with manufacturers and others when quoting competitive prices, in this country it is one of the most important, and not infrequently the very item which precludes our successful competition in the open markets. It is no exaggeration to say that, taking a fairly general view of the carriage and freight rates in force in this country at normal times in comparison with those of Germany, the British manufacturer is saddled with an expense as much as 200 per cent. heavier all-round than that which his keenest competitor has to bear. While in normal times the rate for transport of cutlery from Sheffield to Hull has been 20s. per ton, in Germany it would work out at 6s. 7d. per ton. Similarly the charge for carrying hardware from Birmingham to Newcastle (207 miles) has been 25s. per ton; from Dortmund to Rotterdam (153 miles) it would be 10s. per ton. "One of the largest works in Germany, situated more than 150 miles from a shipping port, could reach Antwerp by rail for 3s. 6d. per ton of finished iron or steel. Similar products transported from works in the Midlands to London or Liverpool, equal distances, are charged about three times as much by the English railway companies."

Nor is the position any better from the travellers' point of view. The railway contract charges in this country for commercial travellers, &c., are at all times a formidable item, and a direct discouragement to manufacturers and others to look after customers far afield by personal attentions. In Belgium a third-class season ticket available over 3,000 miles of railway for five days costs about 10s. 1d., and for a year £14 17s. 6d. The rate in this country over nearly all the leading railway companies' lines for similar distances would be at least three times that figure. One may travel long distances in Belgium for three or four days for considerably less than the cost of the journey from London to Dover and back. For less than 3d. a day a workman in Belgium can travel 37½ miles; a weekly ticket available for six return journeys of 20 km. (12½ miles) costs 1·50 fr., slightly under 1s. 3d., or for 30 km. (18¾ miles) a weekly ticket costs 1·75 fr. (1s. 5d.). In Switzerland it is possible to travel over the whole State system of railways for 45 days for £3 8s. Thus, in Switzerland, for 12 months' travelling available over 3,000 miles of railways, including lake steamers, the cost would be less than £27. In this country the yearly third-class contract between Manchester and London alone is £55 5s.

The feature, however, that appears most inequitable of all is the preferential rates allowed by English shipping companies for goods exported, for instance, from Hamburg to New Zealand, with transhipment at London, a procedure which is cheaper than from London direct. "In Australia there is a widespread belief that German and American manufacturers are helped by lower rates than those obtained

by their British competitors." The explanation in the case of New Zealand is the desire of English shipowners to prevent the establishment of Continental lines to New Zealand, but the method adopted cannot commend itself to British manufacturers. In other instances there is not even this explanation.

When it is considered that the British manufacturer has to contend against such serious disadvantages as these, harassed as he already is by stone-wall tariffs and unfair competition from within and without, it is hardly surprising that he sometimes becomes disheartened. The traditional high reputation of British manufactures all the world over has invariably been the chief selling point against the heaviest odds, but even this great asset cannot hold good for ever against the growing menaces from within as well as from without. Whereas in Germany, France, Switzerland, and practically all the chief European competitive countries, the railway and shipping systems are the auxiliaries and agents of trade, in this country they are the chief drawbacks to trade. One of the first reforms that ought to be insisted upon by British manufacturers and others after peace is restored is the settlement of this carriage problem, which promises, if allowed to continue to exist, to develop into nothing less than a grave injustice to the trading community.

The Mobilisation of Science.

Some weeks ago we hailed with pleasure and relief the announcement of the Government, that it had been decided to establish an Advisory Council on Industrial Research, composed of scientific men, who should make it their business to develop and organise the scientific resources of this country, in preparation for the fierce and unscrupulous competition which may be expected from the Germans in the future. The new scheme was introduced in the House of Commons by Mr. J. A. Pease, the then President of the Board of Education, in an admirable speech, which indicated that he had fully grasped the needs and possibilities of the situation, and was anxious to put the work in hand at the earliest possible moment. No further information has been forthcoming, and since then, unfortunately, owing to the reconstruction of the Government, Mr. Pease has been replaced by a gentleman whose experience and knowledge of the subject cannot be compared with his. We hope, however, that so excellent a proposal will not be allowed to drop or to be postponed, for some such movement is absolutely indispensable to our future welfare—the pity is that in spite of incessant adjurations the Government has hitherto turned a deaf ear to the demands of science for an opportunity to lead the way. Even if the scheme outlined by Mr. Pease is carried out, there is a great risk that the Government, strong in its ignorance of the scientific world, will nominate the wrong men for the work, and thus endanger the success of the new policy at the outset. We earnestly hope that the most expert advice will be obtained lest any such fatal error be committed.

But it is not only in connection with industry that a scientific Council is required; an even more pressing need, if that be possible, is the organisation of science to aid in the prosecution of the war to a successful finish. Our enemies, who neglect nothing that will tell in their favour, have from the first—aye, and long before the outbreak of war—availed themselves of every device that science could evolve to assist them in the subjugation of Europe by fair means or foul, and their scientists have not shrunk from the base uses to which their knowledge has been prostituted. As Mr. H. G. Wells points out in a striking letter to the *Times* of Friday last, modern war—as conducted by Germany—is essentially a struggle of gear and invention. It is a war of surprises, which always emanate from our enemies and against which we have had to improvise means of defence too late to prevent terrible losses. For some of their foul measures, indeed, we have as yet developed no adequate counterstroke. "Throughout almost the entire range of our belligerent activities we are to this day being conservative, imitative and amateurish when victory can fall only to the most vigorous employment of the best scientific knowledge of all conceivable needs and material." Mr. Wells calls for "an acting sub-Government of scientific and technically competent men for this highly specialised task."

The correspondence thus initiated has elicited a number of useful suggestions, such as the formation of Boards of Investigation and Experiment, which should consider ideas submitted to them and put to the test those which appeared to promise useful results; the offer of large money prizes for solutions to military problems; and the utilisation of the resources of our Universities for scientific investigations and tests. Dr. J. A. Fleming states that not only has no use been made of the knowledge and ability of scientific men, but even in some cases steps have been taken to inhibit their activities, as, for instance, in the field of electric waves. Since the war began hundreds of scientists and engineers have pressed their services upon the Government, without success, and young men of the greatest promise have enlisted and laid down their lives, whose expert knowledge and initiative would have been of immense value to their country, if properly utilised. It is even reported that when war broke out orders were given for all experimental work in naval and military departments to cease. We possess a magnificent asset in our scientific and technical experts, of which we have up to now made practically no use; yet there never was a time when their services were so urgently required by the nation. The Government, composed of lawyers and politicians, knows nothing of the nature and resources of science, and it is most necessary that every effort should be exerted to enlighten it and compel it to take immediate steps to organise this body of men who are burning to serve their country, and are, above all others, endowed with the knowledge and ability of which we stand in need, and without which we can hardly hope to bring this terrible war to a speedy and successful conclusion.

Professional Conduct.

A case which recently came before Mr. Justice Neville, in the High Court of Justice, is of interest to all members of the great engineering institutions. As reported in the *Times*, the proceedings were taken by a member of the Institution of Civil Engineers, with a view to obtaining an injunction, pending the trial of the action, to restrain the Council from expelling the plaintiff from the Institution. The Council had drawn the attention of the plaintiff to certain alleged infractions of the rules of the Institution with regard to professional conduct, particularly in connection with the publication of an advertisement by the plaintiff's firm, and, after much correspondence, informed him that he had not discharged the onus of showing that he did not know, or approve, of the advertisement, wherefore he had been guilty of a breach of the regulations, and his name would be erased from the register of membership. The plaintiff at once took legal proceedings against the Council, and applied for an interim injunction, but Mr. Justice Neville, while expressing no opinion as to what the trial of the action might disclose, decided that there was no irregularity in the judicial proceedings of the Council, and refused to make an order.

We have, of course, nothing to say at this stage with regard to the merits of the case, but we welcome the action of the Council in so far as it demonstrates that, recognising the futility of ponderous threats, it has at last decided to take effective proceedings against recalcitrant members of the Institution. It is of the utmost importance to the advancement of the status of engineers that no member of their profession shall be permitted to act otherwise than in accordance with the laws laid down to regulate their conduct. Whether or not those laws are the best and wisest that could be devised is immaterial to the principle at stake. Discipline must be maintained. We see in the medical and legal professions how stern a view is taken of infringements of the rules, and how promptly steps are taken to bring an offender to book; and unless an equally strict *régime* is followed by the engineering profession, it will never attain to the status which they have acquired.

Lead.

THE excitement which has been seen in other metals, more especially in copper and spelter, has proved contagious, and lead has within the last week or so been in a fever of excitement. In May prices of prompt lead were down as low as £19 15s. It was pointed out at the time that the level then reached appeared to be a tempting one, and the forecast has been amply justified by the course of events, for prices have been rushed upwards in startling fashion with a very big business passing. It is decidedly puzzling, however, to ascertain the exact basis of the movement. The market has been filled with predictions that a big movement in an upward direction was in store, and to this extent, the improved tendency took nobody by surprise. Early this week £30 was paid for September, but there has since been a sharp reaction.

What is really astonishing, however, is the extent to which the advance has been carried with so little actual foundation apparent for the movement. There is, of course, a steady and regular business going on in lead, but the main impulse for the buying which has brought about so dramatic an upward movement was entirely speculative, the main portion coming from the United States. It is possible, of course, that something may have happened across the Atlantic justifying the altered tone, and warranting the phenomenal rise in prices in New York, where they are many pounds a ton above those ruling in the United Kingdom.

There is something very suspicious about the entire course of the market, and although it can be admitted frankly that consumption is very large, it is none the less incomprehensible how a rise of pounds in a week is to be justified on trade conditions. It is doubtful, indeed, whether there has been any material increase in the world's actual consumption during the past month or two, although during the same period production has been, if anything, increasing. The import returns into this country show a remarkable growth, last month's figures being as follows, in tons :—

	May. 1914.	May. 1915.	Jan.-May. 1914.	Jan.-May. 1915.
Spain	6,547	9,354	36,400	43,858
U.S.A.	2,233	12,537	7,935	27,847
Mexico	154	—	1,312	250
Australia	5,415	9,118	34,122	32,005
Other Countries ...	3 065	223	14 910	8,207
Total	17,414	31,232	94,679	112,167

Not only are consumers very well supplied with lead, but there have been instances, although these may not be typical, in which consumers have been actually reselling a portion of their holdings, but, on the other hand, the excessive price to which spelter has risen may quite possibly result in the substitution in certain quarters of lead for spelter, as a coating for steel sheets to protect them from weather influences. An interesting criticism on the lead position has been issued by Messrs. James Forster & Co., in the course of which they point out that both Germany and Austria are self-contained so far as lead is concerned, and can probably produce as much as they want. Of the other producers, America has in the last two years probably increased her production of native lead by 150,000 tons per annum, and for the first time in this generation she has sent large and increasing quantities of native lead to Europe. Australia is producing more lead, and Spain is not falling behind in her shipments. There is indeed no lack of lead, and importers have been warehousing considerable quantities. In spite of this, however, the rise has been engineered with persistency, and the market is now undoubtedly very fully committed on the bull side, and looks none too safe, though manipulation of a powerful character may push it higher yet.

Trade with "Neutrals."

UNDER the circumstances which now obtain, still greater circumspection is desirable in placing orders abroad than under peace conditions, and though an advantage in price may be advanced as an adequate justification for accepting a foreign tender in normal times, it by no means follows that the same argument holds good now. Trading with the enemy may assume various disguises, which may not be easy to penetrate, and we must not be unmindful of the ubiquitous ramifications of German trade interests, which like a gigantic octopus have laid their grip on industry in every part of the world. It is, therefore, most important to exercise the utmost caution in all transactions with firms that are in a position to deal with both parties, and that may be more or less under German control. We do not reproach such firms or accuse them of any wrong-doing; they are acting within their rights, but it is for us to be wary.

In view of what we have said above, the folly of placing British orders for electrical plant with them must be apparent. The fetish of the lowest tender which obsesses the minds of British municipalities, and blinds them to the true national interests, still holds sway in certain places, even when we are at death-grips with our foes! We desire to enter the strongest possible protest against all such contracts that present the possibility of advantage and support to our present enemies.

War and Quackery.

As an electrical journal, it does not very often lie directly within our province to discuss matters relating to the public health. There are, however, exceptional reasons, in days of general anxiety, why we should sound a note of warning against some of those various forms of quack "remedies" to which, as experience has proved again and again, the public is ready to fly for relief. We hold no special brief for the qualified medical man, but we do hold one against those who, with the aid of newspaper advertisement and pseudo-scientific pretences, are ready to take unfair advantage of the opportunity to batten on the earnings or savings of poor and rich alike.

Consider a few of the conditions that obtain at the moment, and will almost inevitably become the more acute the longer the war lasts. The number of returned wounded British soldiers probably runs into six figures, many of them having no medical claims under National Insurance; hundreds of thousands of men and women are in anxiety for their relatives with the Forces; professional men and families have been reduced in circumstances; the number of doctors is depleted, and those at home are overworked; the hospitals cannot handle ordinary non-urgent cases as expeditiously as a year ago, war cases rightly having preferential treatment. In conjunction with these conditions, bear in mind that the working classes have more money to handle, and are too ready to spend it, and we see the possibilities of a rich harvest for those who make a business of playing upon the feelings of people suffering either genuinely or imaginatively from neurotic and other disorders. We speak with a ripened experience of the methods employed in the past by sharks of the kind referred to; we know something of the lengths to which they can go, the profits that they make, and the receptivity of the easily deluded mind, when we express a hope that the powers in authority will keep a careful watch over this matter. Pills and potions, and such-like, are not our commodity, and we may properly leave them to others, but where electro-medical "remedies," devices and appliances are in question there is a need for warning from those who recognize the dangers. Such warning is not only necessary in the interests of the uninitiated public, but also in the interests of legitimate electro-medical and electro-therapeutic science and practice. Properly applied, electricity has boundless possibilities for promoting and restoring health, but some of our older readers will remember how in days gone by an extensive traffic in electrical nostrums, which failed to cure, gave a serious set-back to legitimate effort. Genuine electro-therapeutics have advanced wondrously in recent years in our hospitals and elsewhere, and hundreds of thousands of sufferers have benefited from the boon thus placed at their disposal when applied by experienced men. There is a danger that at such a time as this, these and others may confuse the genuine and the spurious.

BATTERY-BELL SIGNALLING SYSTEMS IN MINES.

HOME OFFICE REPORT ON THE DANGER OF IGNITION OF FIRE-DAMP-AIR MIXTURES.

(*Continued from page* 816.)

IN carrying out these experiments an 8 per cent. methane-air mixture was used throughout, and the make and break of the electric circuit were adjusted so as to give the most favourable conditions to produce a spark or flash to ignite the mixture. "These conditions represented the worst possible from the point of view of ignition by the break-flash," and were rather more stringent than those adopted for the experiments carried out at Senghenydd.

"Using a battery of dry cells, and with only the resistance due to the magnet coils of the bell (10 ohms) in circuit, ignition of the mixture was obtained by the break-flash with 2 cells, the voltage being 3·0 and the current on closed circuit 0·3 ampere. Ignition was also obtained when the current was reduced to 0·22 ampere by the introduction of 3·5 ohms (non-inductive) resistance, but not when the current was reduced below 0·21 ampere. One bobbin of the magnet was now removed, the resistance of the remaining bobbin being 5 ohms. Ignition was now obtained only when the current at 3·0 volts was increased to 0·34 ampere. The single-bobbin magnet was found to actuate the bell readily with two dry cells with an additional 8 ohms resistance in circuit, the current on closed circuit then being 0·21 ampere, *i.e.*, well below the minimum igniting current."

Six layers of wire were then unwound from this bobbin, reducing the resistance to 3 ohms, when the minimum igniting current was found to be 0·61 ampere at 3 volts. The bell rang well with an additional 7 ohms resistance in circuit, with a current of 0·28 ampere. Six more layers of wire were then removed, leaving three layers only, with a resistance of 0·5 ohm, and no ignition could be obtained with the full current obtainable from the two dry cells employed, viz., 2·4 amperes, while the minimum igniting current was found to be 2·65 amperes. Thus it was shown that by removing one bobbin and reducing the number of layers of wire on the remaining bobbin it was possible to reduce the self-induction due to the magnet-coils, thereby increasing the current required for ignition by the break-flash, without destroying the ringing power of the bell.

By reducing the amount of wire in the bell, however, its resistance was reduced so that the current passing round the circuit was greater. Thus the full current obtainable on closed circuit from the two dry cells employed, with only the resistance due to the magnet coils of the bell, was (*a*) original bell with two bobbins each of 5 ohms resistance, 0·30 ampere; (*b*) bell with one bobbin having only three layers of wire, 2·40 amperes. Increased safety at the break-flash due to decreased self-induction is, therefore, to a certain extent negatived by increased danger due to the greater current available. To overcome this objection the dry cells were replaced by wet Leclanché cells (quart size), and a battery of two such cells, owing to the higher internal resistance, was incapable of giving a current of more than about 0·8 ampere at 3 volts when short-circuited across the terminals, while with 10 cells the current did not amount to more than about 1·4 amperes at 15 volts. Against this it is to be noted that a battery of two dry cells gave over 4 amperes, and one of 10 cells over 12 amperes, when short-circuited across the terminals.

Probably most colliery electric signal bells are operated by Leclanché cells, hence the reason for high-resistance magnet coils on most of the bells in use. It is due to the demand for a bell that will give a loud signal with a very weak current, to allow for the drop in voltage of the battery when run down. Hence, as was to be expected, "it was found that with a battery of 10 wet Leclanché cells no ignition could be obtained when the single-bobbin bell, with diminished winding, was included in the circuit . . . since the minimum igniting current at 3 volts had been found to be 2·65 amperes, and increase of voltage to 15 does not materially affect the igniting power of the spark." On the other hand, though "the bell rang well with the full current from the 10 Leclanché cells, very little additional resistance, such as would be given by about half a mile of signal wire, served to put it out of action."

Experiments were made with another bell of better construction than the one used previously. The magnet had two bobbins, each with 20 layers of 28-gauge silk-covered copper wire wound on a soft iron core 2 in. long and $\frac{11}{32}$ in. diameter. A battery of 10 Leclanché cells was used with a voltage of 15. The results are given in the following table:—

Condition of magnet.	Resistance of magnet. (1)	Current (bell only in circuit.) (2)	Resistance required to prevent bell ringing. (3)	Current (bell and resistance in circuit). (4)	Minimum igniting current. (5)	Resistance required to reduce current to minimum igniting current. (6)
(*a*) Two bobbins	30 ohms	0·36 amp.	220 ohms	0·05 amp.	0·115 amp.	80 ohms
(*b*) One bobbin	15 ,,	0·55 ,,	230 ,,	0·05 ,,	0·17 ,,	55 ,,
(*c*) One bobbin. Four layers of wire removed	11 ,,	0·65 ,,	240 ,,	0·05 ,,	0·23 ,,	40 ,,
(*d*) One bobbin. Four more layers of wire removed	8 ,,	0·78 ,,	156 ,,	0·08 ,,	0·33 ,,	25 ,,
(*e*) One bobbin. Four more layers of wire removed	5 ,,	0·95 ,,	100 ,,	0·12 ,,	0·55 ,,	11 ,,
(*f*) One bobbin. Two more layers of wire removed	4 ,,	1·00 ,,	70 ,,	0·165 ,,	0·95 ,,	1 ,,
(*g*) One bobbin. One more layer of wire removed. Five layers remaining	3·5 ,,	1·05 ,,	50 ,,	0·18 ,,	No ignition obtained using full current from 10 Leclanché cells.	

With regard to the last experiment, in which no ignition was obtained, it is to be noted that with 10 dry cells (15 volts) an ignition was obtained with 1·30 amperes with an additional 7 ohms resistance in circuit. Hence it is seen that provided not more than 10 wet Leclanché cells form a battery it is impossible to ignite the most sensitive mixture of methane and air, and a good ringing bell can be constructed to operate from such a battery provided it is kept in good order. "The reason for the impotence of the break-flash in the last case (*g*) lies in the greatly reduced self-induction of the circuit due to the removal of so many layers of wire. The extent to which the self-induction of a circuit wound on an iron core is reduced by reducing the number of layers of wire is illustrated by the following determinations made for Dr. Wheeler by Prof. Thornton with the companion bobbin removed from the bell."

Fully wound	0·0950	henry	with a current of	0·17	amp.
With eight layers of wire removed ...	0·0325	,,	,, ,,	0·33	,,
With four more layers of wire removed ...	0·0118	,,	,, ,,	0·55	,,
With two more layers of wire removed ...	0·0053	,,	,, ,,	0·95	,,
With one more layer of wire removed, five layers remaining ...	0·0028	,,	,, ,,	1·30	,,

If columns 3 and 6 be compared it will be seen that in each instance there was a considerable margin between the resistance that could be added to the circuit before the ringing power of the bell ceased, and the resistance necessary to reduce the current available at the break-flash below the minimum igniting current. Thus with the bell as ordinarily arranged with two bobbins, and with a battery of 10 wet Leclanché cells, ringing just ceased when 220 ohms extra resistance was included in the circuit; while the

minimum igniting current of 0·115 ampere was obtained when 80 ohms resistance was added. Hence, if there were added as an integral part of the bell a non-inductive resistance of, say, 90 ohms, the break-flash would be harmless in the most sensitive explosive mixture—provided, as previously mentioned, that not more than 10 Leclanché cells were used—leaving 130 ohms resistance for signal wires, which would be equal to about 10 miles of No. 8 galvanised iron wire, before the bell would cease to ring. It appears, therefore, that the resistance of the signal wires should be measured, and the difference made up with some form of adjustable resistance attached to the bell.

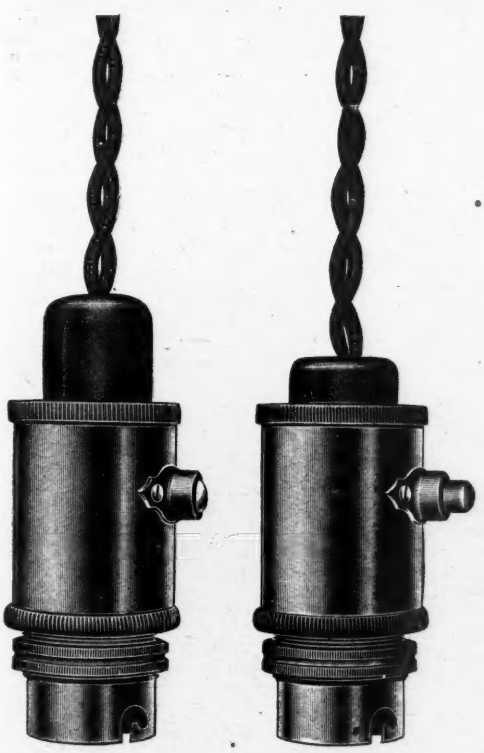
(To be concluded.)

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

H.O. Switch Lampholder.

Messrs. G. St. John Day (Patents), Ltd., of Oldham, have recently introduced a new patent switch lampholder, H.O. pattern, of unusual design, styled the "Daybreak." Briefly, the action is such that "switching on" moves the plunger contacts down on to the lamp cap, while switching off causes them to be withdrawn by a spring movement.

The central portion of the holder, which projects at the top, fig. 1, containing the wiring and plunger contacts, is pressed down to the position shown in fig. 2 to switch on, and is held in that position by a spring catch at one side of the holder. Incidentally, the



Switch open. Switch closed.

Figs. 1 and 2.—"Daybreak" H.O. Switch Lampholder.

lamp (then lighted) is locked in the holder. Pressing the side button releases the catch, allowing the central portion to be forced up (by a spring under compression) and this withdraws the plungers from the lamp cap, thus breaking the circuit. The holder can be taken to pieces by unscrewing a milled ring at the top of the case.

Among the meritorious features claimed by the makers, are that the lamp cannot be removed when lit, nor fixed when the switch is on. The holder is absolutely shock-proof; the circuit is broken at each pole; and the switch can be operated by one hand. The holders are made in the usual standard types and finish.

New Tucker Tumbler Switch.

A new pattern "quick make" and "quick break" tumbler switch, fig. 3, has just been introduced to the market by Messrs. J. H. Tucker & Co., of King's Road, Hay Mills, Birmingham, to fill the demand of consulting and other engineers for this particular switch movement.

A positive action is obtained in the initial opening and closing of the switch; the contacts are of special design; micanite insulation is used throughout, and the base is of vitrified porcelain. In conformity with the firm's custom, this switch movement has been carefully tested, having been mechanically operated over two million times without breaking down.

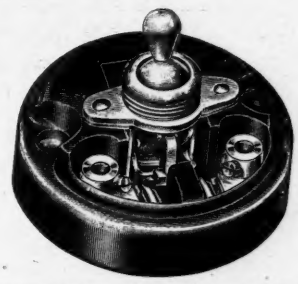


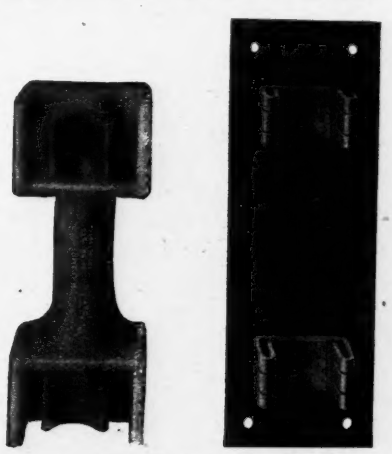
Fig. 3.—Tucker "Quick Make" and "Quick Break" Switch.

The ordinary one and two-way patterns with china or brass covers are made uniform in external appearance with the Tucker flat-type switches.

"Witton" Handguard Cut-Outs.

We illustrate in figs. 4 and 5 the "Witton" handguard cut-outs, which has been introduced by the General Electric Co., Ltd., Witton, Birmingham, as an improvement on existing designs.

The handle and carrier is composed of one porcelain block designed to enclose the contacts of the fuse carrier and the clips on the base. The fuse possesses a self-aligning contact, which is mounted on the porcelain carrier by means of a stud projecting horizontally into the porcelain and held by a nut, the recess for which is seen from the front of the carrier, and is closed by a porcelain cap cemented in. The contact is not held tightly; a



Figs. 4 and 5.—Contacts on Carrier, and Clips on Base of "Witton" Handguard Cut-out.

spring washer gives the contact a small amount of freedom in every direction without interfering with its general rigidity. This freedom is adequate to enable the contacts to adjust themselves to meet any want of alignment in the clips.

A further feature of the handguard cut-out is its adequate ventilation. As will be seen, each contact is cut away at the base so that ample facilities are provided for the access of air to the fuse wire. The latter is carried in the usual asbestos tube which passes through the tubular carrier.

The cut-out is made in a number of sizes, ranging from 15 to 600 amperes.

Standardisation of Electric Motor Vehicles.—The Standards Committee of the American Society of Automobile Engineers, which is stated to be acting in conjunction with the Electrical Vehicle Association of America, has recently devoted considerable attention to the standardisation of certain components of electric motor vehicles. For example, it is proposed to encourage the reduction of practice to two voltage ranges for such vehicles, namely, 80-85 volts and 60-66 volts. For the lead-acid type of accumulator, a standard of 42 cells is to be recommended, while for the nickel-iron-alkaline battery, 60 cells are proposed. Among other recommendations contained in the first report of the Standards Committee are speed and mileage ratings, motor voltages, standard name-plates for electric motors, and the efficiency of solid tires for electric vehicles.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Telephone as Nursemaid.

Three years ago our little boy, only a few months old, was despaired of by our doctor, who recommended open-air treatment as the only hope for his life.

The busy mother could not spare time to be always out with baby—nor could she be continually running out to look after him.

Thus the writer was driven to the idea of fitting a telephone transmitter in the pram. The transmitter was placed inside a cigar-box, which also contained a small American clock (fig. 1).

Baby then spent all his sleeping hours outside, 20 yards away from the house, while the mother could listen in the intervals of work, knowing that so long as she could not hear baby crying

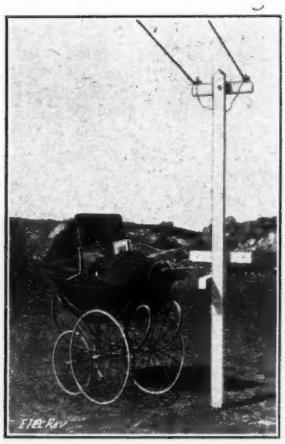


FIG. 1

FIG. 2.

but could hear the clock ticking, all was well. The clock was necessary to provide a constant assurance that the telephone was in order.

Before our doctor went to the Front he made a thorough examination of our boy, and was pleased that open-air treatment, with other care, had removed all traces of his early weakness.

Birds will not approach our house owing to cats, so the old baby's telephone post was utilised to provide a cat-proof feeding tray for birds.

This was frequented chiefly by robins and finches. The idea then occurred to fit a telephone transmitter above the tray so that the birds could be listened to in the house (fig 2.)

This experiment would be still more successful if the telephone transmitter could be concealed among the branches of a tree, in a glade frequented by nightingales, for instance. Here, alas, we have no trees.

The photograph (fig. 2) shows the telephone baby as he is to-day.

It may be noted that after months of winter use outdoors, protected from rain only by an inverted tin, open at its lower end, the telephone transmitter remains in perfect order.

Edwin O. Catford.

Platte Fougère Lighthouse, Guernsey.

Cab Signalling.

Allow me to say that you are performing a much needed public service in permitting the publication of the truth concerning the culpability of the railways and the Board of Trade.

Your correspondents, with the exception of Mr. Von Kramer, have written most clearly and logically about facts that ought to be given the widest publicity at the present time. The extent to which some technical journals have misinformed their readers on this subject makes it all the more important for an electrical journal of the highest standing to allow the exact truth of the whole matter to be told in its columns.

The signalling of our steam railways is a national disgrace. We are many years behind America in track circuiting, and France in cab signalling, although we have all along needed both of these electrical improvements as badly as America or France has needed them. Worse still, even in the little our railways have done in the way of adopting or playing with cab signals, they have, without a single exception, given preference to the inferior types. I say "played with," because the word "test" is a misnomer when applied to the wireless foolishness on which the Midland and the London and South-Western Railways have wasted so much valuable time.

Messrs. Acfield and Sayers *know* that the Dimmond cab signal is by far the best that has ever come before the British public, or else they know less about this signalling subject than hundreds of persons who, like myself, have no interest in any signalling mechanism, but have had sufficient technical training and experience to judge of the merits of such things. Like these hundreds of other technical men who have carefully studied this subject, I want to know why the Midland Railway Co. has discriminated against the best cab signal that has yet been produced, and in favour of two that are decidedly the inferior of the former. In the meantime, as others have aptly said, "The Board of Trade still snores on."

L. Warburton.

Manchester, *June 14th*, 1915.

Electrical Industry in Belgium.

We notice in the article on "Anglo-Belgian Electrical Co-operation in Belgium," in your issue of June 4th, page 786, mention is made of the "Z" lamp of Belgian manufacture.

It has occurred to us that an impression might, through this, be conveyed to the trade that the lamp sold by us is of Belgian manufacture. This, of course, is not the case, the "Z" lamp which is so extensively used here being manufactured throughout at our factory at Southfields, London, S.W.

We should be obliged if you would have a notice inserted in your next issue to obviate any misunderstanding as above suggested.

"Z" Electric Lamp Manufacturing Co., Ltd.,
J. SCRIVENER, *Sales Manager.*

London, E.C. *June 14th*, 1915.

Polish Refugee Students.

May we ask the hospitality of your columns for a few words in the cause of the Polish refugee students, who, being at the point of completing their studies, were surprised by the invaders in Belgium and Northern France, and who, with their Belgian and French fellow-scholars, took shelter in this country?

Among them are chemists, electricians, and mechanics, and several eligible for commercial, literary, clerical, and educational situations. Their number is comparatively small, and it is this happy circumstance that makes us hope that they all may find engagements and prove useful and desirable employés in the British industrial and educational circles.

As to their respectability and recommendations, may it suffice to mention that they have been found worthy of the temporary protection and assistance of the Polish Refugee Fund (Patron, The Earl of Selborne, K.G.), whose appeal on their behalf we heartily second.

Any employers desirous to avail themselves of their services are requested to apply and write for particulars to

The Polish Information Committee,
WM. REPPHAN, *Hon. Gen. Sec*

2, West Street, London, W.C.
June 12th, 1915.

LEGAL.

H.M. POSTMASTER-GENERAL *v.* SOUTHWARK BOROUGH COUNCIL.

AFTER a long hearing, which occupied many days, Mr. Pollock, one of the High Court Referees, on June 10th concluded and gave judgment in this case, which arose out of the necessity to relay the telegraph and telephone cables consequent upon the construction by the Borough Council of a subway beneath the cross-roads at the Elephant and Castle.

Mr. Holman Gregory, K.C., and Mr. Branson appeared for the Postmaster-General, and Mr. Hudson, K.C., with Mr. Frank Dodd, for the Southwark Borough Council.

MR. HOLMAN GREGORY, in the course of his comments at the close of the hearing, said that in all his long experience he had never come across a more unfortunate, or, he might say, a more scandalous piece of litigation, the amount in dispute being only £259, while the costs incurred could not be less than £3,000. The Council, however, said that they had overpaid the Postmaster-General, and as they were going to try and get some of the money back they were not fighting for the £259 only.

The action was brought by the Postmaster-General to recover under the Telegraphs Act of 1878 the balance of certain money which had been expended in relaying the cables rendered necessary by the works of the Borough Council. Under the Act the Postmaster-General claimed the right to make alterations in the telegraph line, and to charge the Borough Council with the cost, or to call upon the Council to do the work. In this case the Postmaster had done the work and had charged the Council with it, the total sum being £1,640. Of this all had been paid with the exception of the balance now claimed, as to which the Council contended they were not liable, as the cost had been increased by the Postmaster-General laying additional ducts. The question was whether more money had been spent in laying 22 ducts than would have been spent in laying the original 13 ducts, and the Council said that under the circumstances the Post Office should bear 9/22 of the cost as representing the additional nine ducts and the Council 13/22 as representing the original 13 ducts which

had to be re-laid. The Post Office engineers contended that so far from increasing the cost, the laying of the nine additional ducts would be a saving in cost, as the boring would have to be the same size for 22 as for 13 ducts, and the additional nine would occupy space which would otherwise have had to be filled up with cement. There was no suggestion in the defence that the designs were wrong or wasteful, but it was alleged that the charges were excessive and unreasonable. On the other hand, it was contended that the question of design and the amount of work necessary to be done were entirely in the hands of the Postmaster-General. The only point, said Mr. Holman Gregory, was whether the Postmaster-General had incurred extra costs by making provision for 22 ducts instead of only 13, and he submitted that the evidence showed that the cost had not been increased thereby.

The OFFICIAL REFEREE, in giving judgment, said he quite agreed that the case was a most unfortunate piece of litigation, and it looked to him as if some people desired to show that their opinion was better than someone else's, and having given their opinion were prepared to substantiate it at the cost of the ratepayers. It was clear that the cost of litigation was enormous as compared with the small sum in dispute. By the order of Mr. Justice Lush he was directed to ascertain what would be the cost of the work upon the basis of 13 ducts, and what would be the cost on the basis of 22 ducts. Early in the year 1910 it was known that the Borough Council was going to construct the subway having a centre near the Elephant and Castle, and notice was given to the Postmaster-General in regard to the matter. The Postmaster-General thereupon decided upon what work was necessary in relation to the alteration in the telegraph lines, and he decided that that work should be carried out by the Post Office. The alterations consisted of the abandonment of two underground telegraph lines containing 13 ducts and the construction of a new line, comprising an underground conduit, the construction of a new manhole, and the enlargement of the existing manhole. While carrying out the work the Postmaster-General increased the number of ducts to 22, which necessitated an increase of a foot in the length and a foot in the width of the new manhole, an increase of one foot in the width of the trenching and of a foot in the existing manhole over and above what would have been necessary if the conduit laid had contained only 13 ducts. A correspondence took place between the Postmaster-General and the Borough Council's engineer, and after some discussion a plan was adopted, showing the general outline under which the Postmaster-General proposed to carry out the work. Some small question was raised as to the date at which those who were doing the work became aware that some alteration was going to be made in regard to the subway which affected the direction of the telegraph lines. In his view the truth lay with those who gave evidence on behalf of the Postmaster-General. The plan was submitted to Mr. Harrison, and no alteration was made in it until they came upon the water which they met with while carrying out the work. The Postmaster-General's officers in carrying out the work began upon the assumption that the subway was as close as possible up to the point where the new manhole was to be constructed, and that necessitated carrying down the manhole to a considerable depth so as to get below the subway. Originally a plan was put forward by which it was proposed that the manhole should actually be under the subway, but the engineers came to the conclusion that it was almost impossible to carry out such a plan as that, and it was decided that the second plan was the better. Mr. Harrison was acting as engineer to the Borough Council, and was aware of the work which was going on. It was competent for him to have gone to Mr. Noble, who was doing the work for the Postmaster-General, and point out that he was doing more than was necessary. But he did not do anything of the kind. The work having been carried on was completed towards the end of the year 1911, when application was made for payment of the account. When that application was made certain objections were raised, and it was suggested that the Postmaster-General had not done the work merely for the purpose of altering the position and direction of the work for 13 ducts, but had done all the work with a view to enabling the Postmaster-General to carry 22 ducts, and Mr. Harrison suggested that it would be reasonable that the Postmaster-General should pay 9/22nds of the costs. That would strike one as being a taking proposition, but it was one which would be absolutely improper, because it was clear that the extra provision would not necessarily increase the cost of the work in proportion. The Postmaster-General had behaved handsomely in giving up some of the extra maintenance, as it was one of the incidental expenses for which he was entitled to be paid had he insisted upon it. Then came the question as to what were the extra expenses consequent upon the increase in the number of ducts; but as to that no evidence had been given. There had been, however, suggestions that there were faults in the design which had increased the cost of the work, and, in support of this, a number of expensive models had been produced in evidence. The question then arose as to who was the proper person to decide as to the proper manner of carrying out the work rendered necessary by the construction of the subway. He did not intend to take upon himself the duty of saying what was right and proper under the circumstances. In fact, by the Act of Parliament he was precluded from doing anything of the kind. The Act said that the alteration was to be made as the Postmaster-General might deem necessary and expedient. That being the statute, and the work being done under the statute, when the matter came into Court, it was said that the Postmaster-General had deemed the work necessary and expedient. No denial of this had been put forward in the defence, and therefore he could only deal with the matter as it came before him. He must deal with it as having been admitted by the defendants that the Postmaster-General deemed the work necessary and expedient. Various questions had been raised in defence, but they were questions as to whether the expenses were such as ought to have been incurred, having regard to the fact that the Postmaster-General had considered the work necessary and expedient. That rendered it quite unnecessary for him to go into the elaborate estimates and calculations made on behalf of the Borough Council. Mr. Noble and Mr. Hardy had been called on behalf of the Postmaster-General, and they gave evidence in support of the view that the work was in substance necessary for the 13 ducts. Mr. Noble said it was necessary to carry down the manhole to the depth to which they did carry it, in order to carry the pipes under the subway. He said that when they got down to a certain depth they met with a considerable quantity of water which rendered extra work necessary. He (Mr. Noble) also said that in carrying the hole down to the greater depth it was necessary to make it larger, having regard to the health of the men who worked in it. It was therefore useless to suggest that the Post Office authorities had made the manholes deeper than was necessary. It had been suggested that Mr. Noble was wrong when he said it was necessary, and he (the Referee) had to consider what was the extra cost, if any, in making the conduit for a greater number of ducts. It was obvious that in making the manholes deeper they must be made larger, and then they would be available for the larger number of ducts. The Postmaster-General had taken the trouble to correspond personally upon the matter, and he (the Referee) came to the conclusion that those who advised him had advised him properly. When it was said that the work was necessary and expedient he was not in a position to contradict it in any way. He was satisfied upon the evidence of Mr. Noble and Mr. Hardy that the work was properly done, and that it was necessary and expedient—that it was work properly done on the basis of 13 ducts. When the Postmaster-General said that the work was necessary he could not in any way interfere. There must be judgment for the Postmaster-General for £259 10s. 5d., with costs.

Judgment was entered accordingly.

A HOUSE WIRING DISPUTE.

IN the Marylebone County Court, on June 4th, before his Honour Sir W. Lucius Selfe, Messrs. Watson, Marsh & Co., electricians, High Street, Brondesbury, sued John Morris Goodwin, owner of South Mansions, Streatly Road, Kilburn, for £3 7s. 6d., balance of an account for work done. In support of the claim, Mr. Marsh said his firm had received instructions to fit up No. 16 flat in these mansions with electric light, to suit a new tenant. The amount of the work and materials was £9 5s. Defendant had paid a sum on account, and left the balance now claimed. Defendant said that the work to be done in this flat was similar to that in one of the flats below it, and the charge there was just over £6, the amount he had paid as sufficient.

PLAINTIFF: The work was the same, except that there was additional main to be run from the Willesden Council service, and there was an additional point, and these accounted for the extra cost in this flat. The actual cost of the work was £6 14s. 7½d., and the balance was for office expenses, insurance, and masters' charges.

MR. GOODWIN: But the lines were put in wooden casing in No. 14, and in this one in tubing.

DEFENDANT: Some were in casing and some in tubing.

His HONOUR: How much was the additional tubing?

PLAINTIFF: About 30s.

MR. GOODWIN: They need not have put in the tubing; they can take it away whenever they like.

His HONOUR gave judgment for £2 5s. 6d., and costs.

GERMAN ELECTRIC POCKET LAMPS.

IN the City of London Court, on June 15th, before his Honour Judge Rentoul, K.C., Messrs. Millard Bros., Ltd., electrical engineers' agents, 123, Houndsditch, sued H. Fox, ironmonger, New Market, Houghton-le-Spring, Staffordshire, for £3 8s. for 1,000 German pocket electric lamps supplied. Defendant did not dispute the claim; but he raised a counterclaim for damages for non-delivery of other electric lamps ordered.

MR. AUSTIN FARLEIGH, plaintiffs' counsel, said that the goods in dispute were Millbro batteries. They had been in the habit of coming from Germany. There was a peculiarity about the present contract, as there was a condition printed upon it which said that the plaintiffs were not to be held responsible in damages "for failure or delay on their part in delivery, resulting wholly or partially from strikes or combinations of workmen or employés, or from any unavoidable total or partial stoppage of works, or from any other cause whatever." Plaintiffs were only the agents for the importation of goods. They were not able to get the goods owing to the war, in time to deliver on August 1st, as promised. But the contract exculpated them from any responsibility for non-delivery. The goods were on the quay at Hamburg still and could not be got over to England.

DEFENDANT stated that the goods were to have been delivered on August 1st, and if the plaintiffs had made their arrangements in time, that could have been accomplished, in spite of the war, which was not declared by England until August 4th. The breach of contract occurred on August 1st.

MR. FARLEIGH: There was an embargo on the goods, and mobilisation was going on before August 1st. The order was given in May, but if we had sent them over then they would have died

before delivery. It is a chemical production, and the batteries were only guaranteed to last for six months. They cannot be re-charged.

Mr. Willoughby, plaintiffs' secretary, said their output of the lamps was 500,000 a year, and they had to disappoint a great many firms. There were still 17 cases, containing 5,000 lamps each, on the quay awaiting shipment at Hamburg.

Judge Rentoul held that the condition of the contract exempted the plaintiffs from any liability, and he found for the plaintiffs for the amount claimed on the claim and counterclaim, with costs.

Beck Engineering Co., Ltd.

A petition to wind up this company compulsorily, presented by the Sloan Electrical Co., Ltd., was before Mr. Justice Neville on Tuesday. Mr. Harrison, for the petitioners, however, announced that the matter had been settled, and he asked that the petition should be dismissed, without costs. His Lordship dismissed the petition accordingly.

Workmen's Compensation Case.

In the Bow County Court on Tuesday, before his Honour Judge Smyly, K.C., and a jury, the resumed hearing took place of a claim under the Workmen's Compensation Act, in which Arthur Edwin Attwell, an engineers' fitter, asked for an award against the West Ham Corporation electricity department. It appeared that the applicant was engaged in cleaning out transformer sub-stations in connection with the electricity department. The electricity was generated at the main station at a pressure of 6,000 volts, and these transformer sub-stations reduced it to a pressure of 200 volts. The defendants had to regulate the working of these sub-stations in accordance with the regulations laid down by the Secretary of State under Act of Parliament, and to have these dangerous places safeguarded so that no accident could occur. The applicant was not an expert electrician, only a workman, and it was therefore more than necessary that they complied with the Act. On April 6th, 1914, the applicant was dusting the incoming main cable when he received a shock and was rendered unconscious. For some time it was thought he had been killed right out. The applicant gave evidence, and said that his hand was badly burned and charred. In his opinion, there was a defect in the insulation. He was paid full wages 37s. 6d. a week for 10 weeks, and then it was suggested that he should do light work. He did do a little walking round with the men, but was unable to do any of his former work, and his money was stopped. He was asking for an award of half wages. He was 31 years of age, and had no technical knowledge of electricity. His duties were the cleaning of transformer chambers, and he knew nothing of insulation. This chamber was 5 ft. square, with a barrier to keep one away from high-tension switches. When the accident happened he was dusting the porcelain where the main cable was connected with the transformer. His left hand became like a piece of bad meat. He now suffered with suffocating pains in the chest. After the accident he was asked to say that he was burnt by the lead that enclosed the wire, and not the porcelain, as if he said porcelain there would have to be a Local Government Board inquiry. He had never been supplied with rubber gloves to work in. He never saw a notice stating that high-tension switchgear might not be touched unless one wore rubber gloves, or stood on the insulating stool or mat. Copies of time sheets were put in to show that the man had been used to high-pressure work, but he said somebody was always with him. Other sheets produced suggested that he had been working since the accident, but he denied this, and said he only walked round with the men, making out the time sheets as he was told. The defence was that the man had never really been "shocked," only burned, and was capable of working. A mass of medical evidence was called to that effect, and the hearing was again adjourned.

WAR ITEMS.

London Works and War Munitions.—It is announced in several daily papers that as the result of a private meeting held recently at the Institution of Civil Engineers in London a Committee has been formed for the purpose of utilising workshop and other suitable accommodation in the metropolitan area for the production of munitions of war. The presidents of the Institutions of Civil, Mechanical, and Electrical Engineers are on the Committee, as are also the leading engineers associated with public works. It is proposed to bring under one central control, such accommodation in workshops and stations of lighting, gas, power and water companies. Mr. F. J. Walker, managing director of the St. James's and Pall Mall Electric Light Co., Ltd., is honorary secretary of the Committee. In the first instance information is being collected as to the engineering plants in the metropolitan area that are available. The *Times* states that the proposal was due to Mr. W. A. Harper, of Messrs. Harper Bros. & Co., consulting engineers, and that the Munitions Committee at the War Office has given its approval. The *Westminster Gazette* says it is estimated that amongst public authorities alone 100 workshops will be available.

Coal-Mining and the War.—The Departmental Committee's report on the effect of the war on the coal-mining industry shows that up to the end of February 191,170 persons from coal mines had joined H.M. Forces. It is considered that the time has arrived when very full deliberation should be given to the question as to whether further recruiting among miners should be encouraged. The loss in production for the year commencing from the outbreak of war will, unless means are taken to reduce the loss, probably amount to 36 million tons. Against this is put a reduction of 24 million tons in exported coal, leaving a net shortage, without further enlisting, of 12 million tons. Among other matters referred to by the Committee is the effect of the Eight Hours Act, and a conference between owners and workmen to determine to what extent, if at all, the Act should be suspended in individual districts, is recommended. The Committee in mentioning the importance of economy in the use of coal by the public says :—"Savings which at once occur to the mind are economies in public and private lighting, whether by gas or electricity, and the manufacture of luxuries which require coal."

Greece.—In a report, shortly to be issued, by H.M. Consul at Piræus, on the trade of that district in 1914, it is stated :—"As compared with imports from the United Kingdom, Austria-Hungary has imported into Greece more than twice the amount in value of the following goods :—Electro-technical appliances, electric conduction apparatus in boxes, electric motors, dynamos, transformers, switch and contact devices, mounted fuses, &c., and also electrical fittings, electric lamps, high-pressure cable and transmission lines, and electrolytic copper.—*Board of Trade Journal.*

Board of Trade Inquiries.—The list of inquiries received for the week ended June 5th for sources of supply of goods, contains the following items :—

Electrical flash lamp cases with switches.
Insulated brass conduit tube to compete with Bergmann tube.
Pea lamps with cord and adapters attached.
Motor lorries, electrically driven.
Tachometers.

Personal.—Mr. Roland J. Prankherd, formerly assistant charge engineer to the Hackney electricity works who, as already announced, joined the 9th East Surreys some months ago, obtained his commission as Second Lieut. in the 22nd Batt. N.F. (3rd Tyneside Scottish), on May 14th. His present address is at "A" Camp, Alnwick.

We learn from Messrs. W. Canning & Co., of Birmingham, that their chief chemist, Dr. W. E. Hughes, M.A., B.Sc., lately serving as a private with the U.P.S. at Epsom, has been granted a commission and been gazetted to the Leicesters. One of their chemical workers, T. Muggeridge, serving with the Worcesters, is a prisoner at Ohrdruf. James Casson, a chemical warehouseman, has been killed in action with the Royal Berks, leaving a widow and three children.

Mr. Gilbert Rosenbusch, M.I.E.E., Assoc.M.Inst.C.E., &c., who is an American citizen born, has changed his named to Gilbert Rowe. In making this announcement, Mr. Rowe desires to dissociate himself from everything German, and expresses his horror and disgust at the methods employed by the German army and navy, which culminated in the *Lusitania* atrocity.

Mr. J. Bissett, of the British Westinghouse Electrical and Manufacturing Co., Ltd., Trafford Park, has been appointed secretary to the Manchester Munitions Committee.

Roll of Honour.—Private C. I. Macdonnell, who has been on service with the 6th West Yorkshire Regiment, is now lying at the First Eastern General Hospital, Cambridge, having been shot in both legs. He was an electrical engineer working in Bradford prior to the outbreak of the war, and is 28 years of age.

Amongst those who are suffering from the use by the Germans of asphyxiating gases is Captain Austin Graham, of Barnard Castle, connected with the 4th Yorkshire Regiment (T.). He is at present in Lady Eveline Mason's Hospital in London. Captain Graham is an electrical engineer.

Private Peter Tolland, of the 2nd Battalion Black Watch, who has been awarded the D.C.M., was prior to the war in the service of the Greenock and Port Glasgow Tramways Co.

Private J. Kilby, of the 1st Northants Regiment, formerly employed by Northampton Electric Light Co, was killed at the Front on May 9th. He was 25 years of age and enlisted in August, going to France in January.

Private A. Meecher, of the Royal Field Artillery, who was engaged on the Hull tramways, has been killed in action.

Intelligence has reached Stockport of the death from wounds received in action in the Dardanelles of Petty Officer Mechanic Oswald New, who was formerly with Messrs. McClure & Whitfield, electrical engineers, of Stockport. He joined the Royal Naval Division last autumn, and went to the Dardanelles in March with the Armoured Car Squadron attached to the Royal Naval Division. He was in his 31st year.

The heavy losses in the East Lancs. Division in the Dardanelles include the name of Major E. L. Baddeley, of the 8th Batn. Lancs. Fusiliers, who died in action June 5th. He was second in command, and held a long service with the battalion, taking field rank in January last year. He was secretary of Messrs. W. T. Glover and Co., Ltd., Trafford Park.

Canfield Tape.—The Canfield Rubber Co., of 27-28, Noble Street, E.C., have brought to our notice their "Canfield" black insulating tape—a strong material impregnated with an adhesive rubber compound which will not dry out; white, gray and red tape is also made. Tests carried out at a well-known laboratory on a single thickness of the tape showed that the pressure required to produce a puncture averaged 970 volts, and the net length of tape per pound was 164 ft.

THE PRACTICAL RESULT OF THE POINT FIVE TARIFF.

BY A. S. BLACKMAN AND THOS. ROLES.

(Abstract of Paper announced for reading before the INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION, *June 17th, 1915.)*

The following is a list, in chronological order, of the undertakings which have adopted the Point Five Tariff, together with the dates upon which the same was put into force:—

Poplar, 1909; Southampton, 1910; Luton, 1910; Bradford, 1910; Sunderland, 1912; Barnes, 1912; St. Marylebone, 1912; York, 1912; Carlisle, 1912; Wrexham, 1913; Accrington, 1913; Sheffield, 1913; West Hartlepool, 1913; West Ham, 1913; Wolverhampton, 1913; Ilford, 1914; Blackpool, 1914; Wakefield, 1914; Worcester, 1914; Ipswich, 1914; Leeds, 1915; Chester, 1915.

The majority, if not all, of the earlier undertakings to adopt the Point Five Tariff did so as a result of independently coming to the conclusion that no substantial progress could be made in the supply of electricity for heating and cooking purposes in their areas at any rate exceeding one-halfpenny per unit.

To the Metropolitan Borough of Poplar belongs the honour of being the first electricity supply authority to adopt such a tariff. The fixed charge at Poplar is varied in the case of the different premises supplied in accordance with the number of kilowatts installed for lighting, heating, cooking, and other purposes, and includes a service charge and charges for the hire of wiring and consuming devices in cases where the two last-mentioned items are supplied by the undertaking on the hire system.

Southampton, the second town to adopt a Point Five Tariff, makes the granting of a halfpenny rate for heating and cooking purposes conditional upon the consumer installing a certain minimum number of lights charged for at ordinary lighting rates.

Luton, the next town to institute a Point Five Tariff, supplies current for heating and cooking purposes at a flat rate of one-halfpenny per unit without any fixed charge or conditions as to lights being installed on the premises supplied.

Bradford, the fourth town on the list, decided to confine its Point Five Tariff to domestic premises, and to base it on the "Norwich" or rateable value system of charging which, with a secondary charge of one penny per unit, had already proved its utility in a number of towns; and practically the whole of the undertakings which have since become converts to the Point Five principle have adopted this system.

So far as the writers are aware, the two methods cited above of arriving at the fixed charge (where made) are the only ones which have been adopted up to the present in connection with Point Five Tariffs, and the difference between these methods is but one of convenience in the working of the tariff, the fixed charge per kilowatt being more strictly correct in individual cases, whereas the apportionment upon the size of the house is an average result which has been found to be a sufficiently close estimate for all practical purposes, and to possess the great advantage of uniformity and simplicity in application.

It should be recognised that the rateable value basis is only made use of as a means which is ready to hand of determining the fixed charge approximately in accordance with the electricity consuming capacities of the premises supplied, and any other readily available basis might be adopted. This method of charging was initiated and put into use by Mr. F. M. Long, of Norwich, over eight years ago.

In most towns in which a Point Five Tariff, based on the rateable value system, has been instituted, the rate is restricted to the supply of electricity to private houses, as this method of determining the fixed charge does not so readily lend itself to the more widely varying conditions of other classes of supply. The percentage of the net rateable value decided upon varies in different towns, being usually between 10 per cent. and 15 per cent. per annum. In at least one case (Sunderland) the percentage is varied between 10 per cent. for a house rated at £30 to 15 per cent. for a house rated at £70 and upwards, the reason for this being that a large house generally furnishes a worse load factor than a small one.

In the case of both Bradford and Sunderland the tariff adopted has been left to justify itself, and no scheme of hiring out heating and cooking apparatus is in existence in either town. Had such hiring schemes been inaugurated, and energetic and sustained publicity campaigns been instituted by the two undertakings, the results shown in this report would have been still more favourable.

In the application of a Point Five Tariff, based upon rateable values, a discretion should be exercised in favour of the consumer who, in consequence of living in a house with an abnormal amount of ground attached to it, is rated out of proportion to the size of the house.

A marked advantage of the rateable value basis is the facility with which an accurate estimate of a consumer's bill can be prepared. Once the fixed charge for a house has been ascertained, a wide error may be made in assuming the number of units that will be used, and the estimate still remain reasonably correct. This facility for estimating has been found in practice to be a very useful asset to the canvassers in towns where a cheap supply of gas has to be competed against. It likewise follows that the importance of any error in metering is correspondingly lessened.

Numerous other advantages have attended the adoption of a Point Five Tariff based on the rateable value system, amongst which the following may be cited:—

When charged under the ordinary flat rate for lighting purposes it was, as a rule, found that residential consumers only introduced electric light into the best rooms, leaving the servants' quarters, etc., which possess a better load factor, illuminated by gas. The fact, however, that on the rateable value basis, once the fixed charge is assessed, all current required for lighting, as well as for heating and cooking purposes, is supplied at the low price of one-halfpenny per unit, has in most cases induced private house consumers to light the whole of their premises electrically, with a consequent improvement in the load factor of the installations.

Further, carelessness on the part of members of households in leaving lights burning while rooms are not in use does not result in the amounts of the accounts being unduly inflated.

In addition to this, under a flat rate of charge the lighting of most houses using electricity compared unfavourably with that of houses illuminated by gas, especially where the mantles in the latter were kept in good condition. The reason for this was that, on the score of economy, lamps of only small candle-power were generally in use. The making of the fixed charge in a house of any given rateable value quite independent of the number and size of the lamps installed, coupled with the supply of current at a cheap rate, has resulted in consumers using lamps of considerably higher candle-power, thus obtaining an illumination at least equal to that of gas-lighted premises. It is now usually quite easy to determine whether or not a house is on the Point Five Tariff by the brilliancy of the light proceeding from the windows of premises taking a supply under this rate.

Taking this class of supply altogether, the additional expenses to the Undertaking consist of the cost of increasing the capacity of the generating plant—which can now be done at far cheaper rates than in the days when the flat rate for lighting purposes was decided upon—and the provision of extra feeder cables.

In both Bradford and Sunderland it has been found that the majority of new domestic consumers adopt the rateable value tariff; houses are, as a rule, wired from cellar to attic; the domestic load factor has improved; the illumination of rooms has in almost every case been considerably increased; and no complaints are now received as to the inefficiency of electric lighting as compared with lighting by means of gas.

Prior to Point Five Tariffs being put into force, electricity was used for heating purposes by a number of consumers in the towns mentioned in this Report at prices varying from the ordinary lighting rates to one penny per unit, the heating medium usually being a one-kilowatt four-light radiator. Much dissatisfaction was, however, expressed at the amount of heat given off by radiators of this capacity and at the expense attached to their use. Since current has been supplied at one-halfpenny per unit, however, not only has the number of electric heaters increased to a tremendous extent, but the capacity of the individual heaters has also increased, so that fires taking three and four kilowatts are now quite common; in fact, in several Point Five towns the three-kilowatt radiator has become a standard. The result is that instead of electric radiators being used to warm the occupants of rooms by radiant heat, the air temperature of the rooms being but little affected, the temperature of the apartments is kept practically constant throughout, and the occupants are under no necessity to remain within the direct rays of the heaters.

The Electricity Supply Undertakings under the management of the writers are both situated in industrial towns, so that the house supply load is not as important as in some areas where it is the chief source of revenue. In Bradford the units sold to private houses are only 3 per cent. of the total sales, and in Sunderland 2.6 per cent.

BRADFORD RESULTS.

No better testimony to the popularity of the Point Five Tariff in operation in Bradford can be furnished than the fact that at the 31st December last 1,298 private house consumers were connected to the supply, whereas prior to the introduction of this method of charging on the 1st July, 1910, the number of such consumers was but 511, representing the result of nearly twenty-one years' working. It will thus be seen that during the four and a half years the Point Five Tariff has been in force the number of domestic consumers has increased by 787, or over 150 per cent. Four hundred and three, or more than half, of these consumers, have elected to be charged on the special rate, the houses being in practically all cases electrically-lighted throughout.

Of the 511 private house consumers on the supply at the 30th June, 1910, 383 have adopted the Point Five Tariff in place of the lighting flat rate of 4d. per unit under which they were previously charged. Owing to changes of tenancy and alterations in other conditions the comparison given below relates to only 138 of the consumers changed over, the periods covered being the year prior to the introduction of the Point Five Tariff and the year ended 31st December, 1914.

Based on the total kilowatts installed the average load factor of the 138 consumers in question has increased from 3.38 per cent. to 4.34 per cent., equivalent to an increase of 28.4 per cent.

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Units Sold for a Complete Year.

Under old Tariff	93,880
Under Point Five Tariff	182,872
Average per house under old Tariff	680
Average per house under Point Five Tariff ...	1,325
Increase	94.9 p.c.

Revenue.	£ s. d.
Total under old Tariff	1,566 0 0
Total under Point Five Tariff	1,358 0 0
Average per house under old Tariff	11 5 6
Average per house under Point Five Tariff ...	9 16 10
Average price under old Tariff	3.98d.
Average price under Point Five Tariff	1.78d.

The following table gives details in the case of all domestic consumers connected for the complete twelve months ended 31st December last:—

Tariff	4d.	.5d.
Number of consumers	340	566
Total units sold	124,742	612,502
Average number of units per house	367	1,082
Total revenue	£2,005	£4,312
Average revenue per house	£5 18 0	£7 12 4

The particulars given below illustrate the effect the Point Five Tariff has had on the diversity factor, the periods compared being the twelve months ended 30th June, 1910, and the twelve months ended 31st December, 1914.

Twelve months ended ...	June 30, 1910.	Dec. 31, 1914.
Maximum load on L.T. feeders for residential areas only	158 KW.	290 KW.
Total kilowatts installed in private houses	420 KW.	853 KW.*
Diversity factor	2.65	2.94

* This is the total for which application has been made. It has, however, been found since the introduction of the Point Five Tariff that heating and cooking apparatus, particularly the former, has been connected in private houses to a considerable extent without the Electricity Department being notified. Consequently the figure given is very much on the low side, and this naturally reflects on the diversity factor, which is undoubtedly greater than 2.94 as stated.

In conjunction with the above table, it may be mentioned that the 420 kilowatts of consuming devices installed at the 30th June, 1910, in private houses in the residential areas dealt with were almost exclusively for lighting purposes. As at that date the number of consumers affected was 233, an average of 1.8 kilowatts per house is obtained.

At the 31st December, 1914, the consuming devices in connection with the installations in these particular areas had increased to 853 kilowatts and the number of consumers to 367, giving an average of 2.32 kilowatts per house. Of the total of 853 kilowatts connected, 545 were for lighting purposes and 308 for heating and cooking purposes, the average per house being 1.48 and 0.84 kilowatts respectively.

The annual percentage of the rateable value debited to a consumer in Bradford adopting the Point Five Tariff is 15, and it is estimated that such percentage, coupled with a charge of one halfpenny per unit, brings in a revenue equivalent to what would be earned for an average supply of current for lighting purposes at a flat rate of 4d. per unit. All energy required for heating and cooking purposes is under these conditions obtained at the halfpenny rate.

Although in Bradford domestic consumers have not been approached individually for the purpose of explaining the advantages they would enjoy by changing over from the flat rate to the Point Five Tariff, more than half of such consumers have elected to be charged on the latter system, and have introduced electric heating or cooking apparatus. This is all the more remarkable when it is borne in mind that no general attempt has been made to induce consumers to install heating and cooking apparatus, the staff of the business-development department having been fully occupied in dealing with power supplies.

In addition to this, an agreement has been in existence between the Gas and Electricity Departments that in thoroughfares in which electricity mains are already laid the Electricity Department's canvassers shall not call upon gas consumers with a view to persuading them to take an electricity supply. Furthermore, the Gas Department have been exceedingly active during the past few years in advocating the use of gas for heating and cooking purposes.

The following extract from a letter received by one of the writers from Mr. P. Collinson, the Honorary Secretary of the Bradford Branch of the Electrical Contractors' Association (Incorporated), is of interest as expressing the views of the Bradford Wiring Contractors on the Point Five Tariff in operation in that city:—

"The Domestic Tariff is one that is popular among your consumers in that it is quite simple and easily understood: in this it differs materially from your Maximum Demand System of charging, which I find to be quite beyond the grasp of the average lay mind and which further is looked upon with some degree of suspicion.

"By enabling one set of wires to be used for both heating and lighting, the Domestic Tariff simplifies the wiring of a house and, therefore, reduces the initial cost of the installation, and by so doing tends to popularise the use of electricity. In addition to this I find that extensions of wiring are easier and not so costly as when the house is wired in duplicate for both heating and lighting.

"I find that where the Domestic Tariff is in operation it is much easier to persuade the user to extend both his lighting and heating installation than is the case when the user takes his energy at the old Flat Rate; the argument that the additional load will only add so much electricity at ½d. per unit to his bill usually proves irresistible. The large increase in the number of radiators installed in Bradford during the past few years is undoubtedly a direct result of the Domestic Tariff, and I believe that it is only under this system of charging that electric cooking will make appreciable headway.

"Looking at the Domestic Tariff from a Contractor's point of view, I am satisfied that it is a system of charging which makes for increased business, and as it appears to give satisfaction to the user, it has my emphatic approval, coupled with the hope that the principle may, at an early date, be extended to those of your consumers who are occupiers of shop, warehouse, and other business premises, and who are at the moment excluded from the scope of this tariff.

"In conclusion I may add that the opinions expressed in this letter are not my personal opinions only, but are the opinions of the bulk of my confreres in this city."

Sunderland Results.

At the introduction of the Point Five Tariff there were 337 private houses connected to the supply, the majority partially lighted only, as the result of sixteen years' working. Since the tariff was introduced upon the 1st of January, 1912, three years' working has resulted in 162 more private houses being connected; 100 of these elected to be put on the Point Five Tariff and are lighted throughout, and 62 upon a flat rate of 3.6d. per unit.

Of the 337 houses that were on the supply at the 1st January, 1912, 105 have changed over from a flat rate of 3.6d. per unit to the Point Five Tariff, and of these 105 houses 87 have, owing to there being no change of tenancy, been taken for the following comparison, the periods being the year preceding and the year following the adoption of the Point Five Tariff:—

The average of consumers' load factor on kilowatts installed has been increased from 2.44 per cent. to 4.05 per cent., an increase of 66 per cent.

Units Sold for a Complete Year.

Under old Tariff	44,827
Under Point Five Tariff	93,327
Aver. per house under old Tariff	512 (354)
Aver. per house under Point Five Tariff	1,073
Increase	109.5 p.c. (203.1 p.c.)

Revenue.	£ s. d.	
Total under old Tariff	672 0 0	
Total under Point Five Tariff ...	616 0 0	
Aver. per house under old Tariff ...	7 14 5	(£5 5s. 9d.)
Aver. per house under Point Five Tariff	7 1 7	
Aver. price under old Tariff	3.6d.	
Aver. price under Point Five Tariff ...	1.58d.	

For the purposes of comparison it must be remembered that the units and money values underlined refer almost entirely to carbon lamp conditions, and our experience with pure lighting installations that have remained upon our mains unaltered over a term of years, save for the transition from carbon to metal filament lamps, shows that for purposes of comparison under modern conditions the figures in brackets should be substituted for those underlined, and this has been done for the purpose of the following comparison.

The comparative results obtained from alternative tariffs for all private houses connected for the year ended 31st December, 1914, are as follows:—

Tariff	3.6d.	.5d.
Number of consumers	212	286
Total units sold	75,032	298,563
Average number of units per house	354	1,044
Total revenue	£1,121	£1,803
Average revenue per house	£5 5 9	£6 6 11

The following table shows the effect of the Point Five Tariff upon the diversity factor, the periods being "A." just before the introduction of the tariff, viz., December, 1911, and "B," December, 1914.

	"A."	"B."
Maximum load on L.T. feeders for residential areas only	141 KW.	227 KW.
Total kilowatts installed in private houses	461 KW.	1,152 KW.
Diversity factor	3.25	5.00

It will be noted that the results shown in the two foregoing tables as between the 3.6d. and the Point Five Tariff, and as between the periods "A" and "B" are very considerable.

A number of tables are appended to the Report.

A BATTERY AMALGAMATION.

[PRITCHETTS & GOLD AND ELECTRICAL POWER STORAGE CO., LTD.]

IN our last issue we published in our report of the speech of Mr. James Gray, chairman of the Electrical Power Storage Co., Ltd., some particulars of the scheme for amalgamation of the business of that company with that of Messrs. Pritchetts & Gold, Ltd. We are now enabled to give some information respecting the arrangements that have been made for the future.

The capital of Pritchetts & Gold, Ltd., at present stands as follows :—

5 per cent. cum. pref. shares, £1 fully paid ...	£24,907	£44,907
Ordinary shares, £1 fully paid	20,000	
No debentures.		

The paid-up capital of the E.P.S. Co. is thus :—

5 per cent. debentures	£10,000	£103,290
Ordinary shares. £5 fully paid	92,960	
Founders' shares, 66 of £5 each...	330	

The E.P.S. Co., as already announced, will go into liquidation, and the Pritchetts & Gold, Ltd., will change its name to that given at the head of this article. It will also increase its capital and alter the status of the shares. A further 20,000 5 per cent. preference shares of £1 each will be registered; and the existing 20,000 ordinary shares will become ordinary "A" shares, non-cumulative, and entitled to a dividend of 15 per cent. There are also to be created 20,000 "B" ordinary shares of £1 each, non-cumulative; 14,000 1s. deferred shares (£700); also 5 per cent. first mortgage debentures of a total not exceeding £20,000.

The terms of purchase are: £10,000 debentures, 18,658 ordinary "B" shares, and 4,000 deferred shares. The balance of the purchase consideration being dependent upon the valuation of stock-in-trade, &c., at the end of the year (June 30th), cannot yet be stated, but it is to be paid either in preference shares or in debentures, but not exceeding £10,000 in debentures, making the total thereof £20,000. The E.P.S. Co. will take 4,000 of the 1s. deferred shares, leaving 10,000 to be subscribed for by the present ordinary shareholders of Pritchetts & Gold, Ltd. The proportion of profit will thus be five-sevenths to the shareholders of Pritchetts & Gold, and two-sevenths to the shareholders of the E.P.S. Co.

In regard to directors, the boards of the two concerns will be amalgamated. Mr. G. E B. Pritchett will continue in the chairmanship, and Mr. James Gray will be deputy-chairman. The other directors will be:—Sir James Pender, and Messrs. A. G. Gold, F. C. Graham Menzies, T. W. Pritchett, C. R. D. Pritchett, and David Willock. Messrs. G. E. B., T. W., and C. R. D. Pritchett will continue to act as managing directors. The principal members of the E.P.S. works and secretarial staffs will hold office under the amalgamated concern. The E.P.S. works at Milwall will be closed as soon as is practicable, and the works of Pritchetts and Gold, at Dagenham Dock, which have only been working for a year, and are laid out on most modern lines, are being much enlarged so as to accommodate the operations of the two businesses. The company has four acres of land there. It is interesting to note that the company, which has hitherto taken its supply of energy from outside sources, is now building a power-house of its own which will render it both independent and able to deal with the greatly increased power demand that the larger business to be handled will involve. The offices of the E.P.S. Co., at 4, Great Winchester Street, E.C., and those of Pritchetts & Gold, Ltd., at 58, Victoria Street, S.W., will be closed at the end of the month, and the company's office operations (estimating, secretarial and general business, in fact everything excepting actual manufacturing) will be concentrated at new offices situated at 82, Victoria Street, S.W.

The amalgamation of two well-known English battery manufacturing concerns is an event of no small interest to the electrical industry. "E.P.S." are household letters known all over the world—many electrical men learned them as part of their professional alphabet long years ago—and they will not now disappear. Pritchetts & Gold, too, is a popular name among engineers and battery users generally. It is nearly 30 years since Mr. G. E. B. Pritchett first began the manufacture of batteries. In 1890 his work was continued under the name of Pritchett Bros., and in 1892 as Pritchetts & Gold, at Woolwich. Five years later the business was removed to Feltham, and in 1901 the concern was formed into a limited liability company as Pritchetts & Gold, Ltd. Thirty years ago the late Mr. G. E. Pritchett—father of the three gentlemen who have enterprisingly built up the business now in mind—showed, though not an electrical engineer, a very keen appreciation of, and belief in, electrical matters when he founded, in conjunction with his son, Mr. G. E. B. Pritchett, the business of G. E. Pritchett and Co., which owned an electric light station at Blackhorse Yard, Rathbone Place—which is now a part of the Marylebone electric supply system. To his sons, in conjunction with those who have been closely identified with the operations of the Electrical Power Storage Co., Ltd., it has now fallen to carry through a business operation which indicates a keen appreciation of future possibilities, and augurs well for economical and otherwise successful manufacture along lines which will ensure for the amalgamated concern a leading place among the battery makers of the United Kingdom, and will enable it to make a good stand against foreign competition in all parts of the world when things industrial begin to return to the normal—if they ever do so.

BUSINESS NOTES.

Advance in Prices.—MESSRS. KELVIN, BOTTOMLEY AND BAIRD, LTD., of Glasgow, announce that owing to the recent rise in cost of both material and labour, due to the present war conditions, they are compelled to increase all prices by 10 per cent. as from June 1st. The new prices are present list prices less schedule discounts, plus 10 per cent. advance.

Private Arrangements.—A. C. BIRD, general and electrical engineer, 22, Regent Street, Hinckley.—The creditors interested herein were called together recently, when a statement of affairs was submitted which showed liabilities of £920, all of which was due to unsecured creditors. The assets were estimated to realise £422, from which had to be deducted £17 for preferential claims, leaving net assets of £405, or a deficiency of £515. It was reported that the debtor started the present business a little more than a year ago. Prior to that date he had been in partnership with another man. He had little or no capital when he started the present business. The liabilities included cash claims of £214, while the bank were creditors for £172. The bank held a guarantee for £100. In consequence of pressing creditors, a deed of assignment had already been executed with Mr. Millman, I.A., Leicester, as trustee. The creditors, after a short discussion, decided to confirm the deed already executed.

Catalogues and Lists.—MESSRS. DRAKE & GORHAM, LTD., 1, Felix Street, Westminster Bridge Road, London, S.E.—8-page illustrated pamphlet (No. 233) giving prices and particulars of their "Phœnix" electric fans, including desk, oscillating, ceiling, porthole, and box-blade types.

BRITISH THOMSON-HOUSTON CO., LTD., Rugby. — Descriptive list No. 6,500 (20 pages) giving very full particulars with illustrations of their steam, water and air-flow meters of various types, their principle, construction and installation.

MESSRS. BRITISH INSULATED & HELSBY CABLES, LTD., Prescot.—4-page illustrated and priced circular giving particulars of the Prescot twin house-wiring system (cables and joint-boxes).

MESSRS. J. H. HOLMES & CO., Newcastle-on-Tyne.—Illustrated pamphlet No. 73, describing their cellular type switchboards (2,000—6,600 volts, A.C.); also single units for controlling the H.T. side of motor-generator and independent exciter control pillars.

STERLING TELEPHONE AND ELECTRIC CO., LTD., 210-212, Tottenham Court Road, London, W.—Publication No. 223, giving illustrated particulars and prices of their "Equipoise" telephone arm; also illustrated price-sheet of loud single-stroke bells for railways, mines, &c.

Book Notices. — "*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXXI, Part 2. June, 1915. Newcastle-on-Tyne: The Institution. Price 5s.

"Modern Boiler Room Practice and Smoke Abatement." By J. T. Hodgson. London: "The Railway Review." Price 3s. 6d. net.

"A.B.C. of Electricity." By W. H. Meadowcroft. London: Harper Bros. Price 2s.

"A Treatise on Hand Lettering." By W. J. Lineham. London: Chapman & Hall, Ltd. Price 7s. 6d. net.

"Circular of the Bureau of Standards."—No. 49, "Safety Rules to be Observed in the Operation and Maintenance of Electric Equipment and Lines." No. 54, "Proposed National Electrical Safety Code." Washington: Government Printing Office.

Electric Vehicles.—The latest addition to the list of manufacturers of electric motor vehicles is ELECTROMOBILE (LEEDS), LTD., whose works are at 32, Neville Street, Leeds. Pleasure cars as well as industrial vehicles, with carrying capacities ranging from 7 cwt. to 5 tons, are being turned out.

Electric Clocks.—THE SYNCHRONOME CO., LTD., state that the industry of electric clockmaking has felt the pressure of war time, and this has made it easier for them to spare no less than 50 per cent. of their staff, who are now serving H.M. Forces in some capacity or another. Rapid extensions of their circuits of electrical impulse dials have, however, been required in munition factories and shipyards, and in many buildings now used as war hospitals. They are also extending the electric time circuits in Euston station for the L. & N.W. Ry. Co., at Waterloo for the L. & S.W. Ry., and at Port Sunlight for Lever Bros., Ltd., and providing new installations of electric clocks in the Civil Service Commission, Burlington House, for the Office of Works; the new offices of the Western Union Telegraph Co., Ltd.; Messrs. Pilkington's Glass Works, St. Helens, &c.

Bankruptcy Proceedings. — DENIS R. BROADBENT, 50, Hans Place, Chelsea.—The first meeting of creditors was held on Monday at the London Bankruptcy Court under this failure. Mr. E. Leadam Hough, Senior Official Receiver, reported that it appeared from the debtor's statements that he qualified as an electrical engineer in or about 1890, but had never carried on business on his own account. When he came of age he became entitled to about £5,000 under the will of a relative, and had lost it all in investments in certain public companies. In 1900 he formed the British Electrical Manufacturing Co., Ltd., with registered offices at 37, Walbrook, E.C., and works at Putney Bridge Railway Arches. The object of the company was to purchase from the debtor, as a going concern, the business of J. D. F. Andrews & Co., Ltd., electrical engineers, which he had at that time purchased with his own money for £2,500.

The nominal capital of the company was £10,000 in preference and ordinary shares. Under his agreement with the company the debtor received, in consideration of the transfer of the business, £2,000 4 per cent. debentures, 250 preference and certain ordinary shares. He was appointed director at £4 per week, inclusive of fees. He subsequently put a further £500 into the company, but about two years after its formation the company went into voluntary liquidation, and the debtor altogether lost £3,000 in the concern. In 1905 he purchased £200 worth of shares, and subsequently a further £200 worth, in the Deuxphone Manufacturing Co., Ltd., of Newton Abbot. That company carried on business for about two years and then went into voluntary liquidation, the debtor losing the £400 he had invested in it. He had been interested as director or otherwise in a number of other companies, over which he lost money, and no statement of affairs had been lodged, but the debtor roughly estimated his liabilities at £1,370, and did not admit insolvency. The meeting was adjourned.

A. Whiteley, electrical and mechanical engineer, Llandudno.—A first and final dividend of 6s. 10½d. in the £ is payable on June 25th, at the Official Receiver's office, Crypt Chambers, Eastgate Row, Chester.

Liquidation.—Pintsch's Electric Manufacturing Co., Ltd.—This company is winding up voluntarily, with Mr. H. W. Kirby, of Bassishaw House, Basinghall Street, E.C., as liquidator.

For Sale.—Bolton Corporation has for disposal four 270-H.P. engines; four 200 kw. Ferranti single-phase, 83-cycle alternators, 2,000-2,200 v.; three 30 ft. by 7 ft. 6 in. Lancashire boilers and superheaters. Particulars are given in our advertisement pages.

Trade Announcement.—Messrs. J. P. Strange and P. G. Hobbs, trading as the Electrical Installation Co., of 42, Monson Road, Tunbridge Wells, give notice that, having been called up for service in H.M. Forces, they find it necessary, at any rate temporarily, to close their business. They have appointed Mr. Percy Wickenden, chartered accountant, 1 and 2, The Broadway, Tunbridge Wells, receiver of the partnership assets, to whom all accounts should be sent for payment.

Catalogues Wanted.—Mr. E. Pogson, who has recently taken charge of the electric power installation at Ripon Camp, invites manufacturers to send him catalogues of engine-room stores, overhead-line material, switches, fuses, meters, cables, lamps, &c.

LIGHTING and POWER NOTES.

Argentina.—The first electric furnace in South America is about to be installed at Buenos Ayres. It will, says *La Electricidad y la Maquinaria*, be capable of smelting metals on a large scale, and will be installed in "our laboratory," presumably that of the Instituto Sudamericano de Electricistas y Mecanicos, of which that paper is the official organ.

Ashton-under-Lyne. — Street Lighting. — The restrictions on public lighting have been relaxed, but it is not considered desirable to go back to arc lighting, as the half-watt lamps which have been introduced give twice the light at half the cost.

Barnsley.—Year's Working, &c.—The electricity department made a profit on the year's working of £1,115, which it was decided to carry to reserve account. The Works Sub-Committee has decided to increase the wages of stokers and drivers employed at the electricity works from May 20th, overtime to be paid for in future in accordance with local conditions and all broken time to be stopped, and no further payments to be made during absence through ill-health. The Electricity Committee has decided, owing to the increased price of coal, increased cost of labour, &c., to raise the price for current as from July 1st, 1915, by 1½d. per unit for lighting purposes, and by 15 per cent. for power purposes. The coal contracts for the next 12 months had recently been let at an advanced price of £2,400.

Barton-on-Humber.—Restricted Lighting. — On account of the suspension of street lighting the Electric Supply Association has agreed to forego half the balance of the sum due for the year on account of public lighting.

Beckenham.—Price Increase.—On account of the enormous increase in the price of coal, and the advance in the cost of materials and wages, the U.D.C. has decided to increase the price of current for the ensuing quarter by 15 per cent.

Berwick-on-Tweed.—The T.C. has decided to have the Council Chamber lighted by electricity, and has accepted the offer of the Electric Supply Co. to fix four ceiling fittings with 100-c.p. lamps.

Bidford-on-Avon.—E.L. Scheme.—After considering a proposal by Messrs. Pullan & Best, of Bradford, to provide an E.L. installation for the district through a local company to be formed, the P.C. has passed a resolution stating that it is favourable to the proposed scheme.

Bispham.—The working of the Council's electricity undertaking for the year ended March, 1915, shows a deficit of £399, as against £616 in 1914. The estimated deficit for 1916 is £650.

Bradford.—L.G.B. Inquiry.—Last week an inquiry was held into the application of the Corporation for sanction to borrow £2,977 for the reconstruction of cells at the destructor works, Sunbridge Road.

Carnarvon.—The Electricity Committee reports that as the result of further representations, the L.G.B. has agreed to consider the application for borrowing powers for the extension to Bryn Seiont.

Chesterfield. — Plant Extensions. — The T.C. has received a letter from the Chesterfield Tube Co. stating that, as the Corporation was meeting the present demand for power, it did not consider that the expenditure of the £5,000 which the Corporation found necessary need be undertaken on its account alone. The Council has decided to purchase an alternator, boiler, superheater, mechanical stoker and economiser, at a total cost of £2,706, and it was stated that it was hoped in the near future to complete the scheme which the Electrical Committee brought forward in February, 1914.—*Nottingham Guardian.*

Continental. — France. — Work has recently been completed on the new hydro-electric power plant near Bramis, in the Valley of the Rhone, for the Société d'Aluminium de Neuhausen. The water power of the River Borgne is utilised, the water being taken in the Eriny Valley and piped to Bix, whence to the power plant—which is equipped with turbines of a total capacity of 30,000 H.P.—a fall of nearly 400 ft. is obtained. The current generated is being used in the Neuhausen Co.'s works at Chippis, where a total of no less than 100,000 H.P. is now available.

Darwen.—Increased Prices.—The Corporation has decided to increase the charges for electricity for public and private lighting by 10 per cent., and for power purposes by 20 per cent., apart from sealed contracts and tramways.

Great Harwood.—E.L. Scheme.—The proposed electricity scheme has been deferred in consequence of the war. Application is to be made to the B. of T. for a renewal of the Electric Lighting Order.

High Wycombe.—Price Increase.—The Electricity Co. has increased the price of current for power, lighting and heating by 10 per cent. as from July 1st.

Hexham.—Increased Prices.—The Hexham and District Electric Supply Co., Ltd., has given notice that the charge for current for lighting purposes will be increased from 5d. to 6d. per unit from July 1st; terms, discounts, &c., remain unaltered.—*Newcastle Daily Journal.*

Heywood.—Loan Periods.—The L.G.B. is to be asked to fix an equated period for the borrowing of £6,355, sanctioned on March 26th last, for the electricity undertaking.

Ilford.—The proposed new tariffs have been referred to a small sub-Committee to consider in detail and report. The Electricity Committee has deferred, for the present, a report of the electrical engineer on the question of providing mechanical stokers for two boilers at the works. The electrical engineer is in communication with a firm of accumulator manufacturers respecting a supply of current for their projected new works.

Kilkeel (Co. Down).—Proposed E.L.—The Council has decided to apply to the Irish L.G.B. for powers for the electric lighting of the town.

King's Lynn.—Year's Working.—The annual accounts of the Council's electricity undertaking for the 12 months ended March 31st last show that the income amounted to £7,992, as against £8,519 in 1914; the expenditure was £6,642, as compared with £6,742 in the previous year, leaving a profit of £1,350, as against £1,776. It was decided that the whole of the surplus should be applied in reduction of capital money borrowed for electricity purposes. The total number of units sold was 615,803, as compared with 669,874, and the average price obtained was 2·76d. per unit, as against 2·66d. The Electricity Committee has decided to reduce the charge for public lighting for the year by £300, owing to the restricted lighting.

Kirkcaldy.—Financial Estimates.—The Corporation Electric Lighting and Tramway Committee has submitted the estimates for the ensuing year. Owing to the rise in the price of coal, the deficiency in the electricity department is estimated at about £3,000, to meet which it has been decided to increase the price charged for private lighting and power by 25 per cent., and for tramway supply by ½d. per unit. To meet the loss on the tramways it was decided to abolish all overlapping of ½d. stages.

Long Eaton.—Electricity Charges.—The following revised scale of charges for current has been adopted by the U.D.C.:—Domestic lighting, 4d. per unit, less 5 per cent.; factories, 3½d. per unit for the first 2,000, and 2½d. beyond; public lighting, 2d., less 5 per cent.; power, 1½d. for the first 1,500 units, ·85d. beyond, less 5 per cent.; heating and cooking, 1d., less 5 per cent.

Linton.—WORKHOUSE LIGHTING.—Owing to the heavy rates payable to the County Council, the Board of Guardians has decided that it cannot incur the expense of the proposed electrical installation at the workhouse premises.

London.—FULHAM.—The linking-up scheme of the boroughs of Battersea, Hammersmith, and Fulham provides for the laying of connecting mains between the generating stations, and the provision of suitable transforming plants at each station. The cost of the mains and their maintenance is to be shared equally by the three Councils, the work to be carried out under the supervision of the Fulham Council. Each Council will bear the cost of its own transformer station and transforming plant. It is proposed that the agreement giving effect to the scheme shall be for a period of 25 years, and that each Council shall extend its plant, in rotation, as and when the combined generating plant is insufficient to meet the combined maximum demand in the three areas of supply concerned, Fulham to be the last to extend. The charges to be made have been provisionally agreed and are mutual, and subject to revision every five years. The estimated cost of the connecting mains is £17,441, of which the Fulham Council will be responsible for one-third or £5,813, and the estimated cost of providing the transformer room and transforming, &c., plant at the Townmead Road station is £2,562, making a total of £8,376. It is anticipated that only part of the connecting mains provided for in the above estimate will be laid in the first instance. The Electricity Committee recommends the Council to approve the scheme subject to the agreement being approved by the Law and Parliamentary Committee, and that application be made to the Board of Trade and the L.C.C. for sanction to its adoption, and to the Treasury for sanction to the necessary loan to carry out the work.

WOOLWICH.—An agreement has been sealed with the Secretary for War for the supply of electricity to the Bostall Heath Camp. The Electricity Committee reports that, up to the present time, no meter rents have been charged to customers, except in special circumstances. Having regard to the fact that it often happens that more than one meter is required in a private house, and two or more, per service, in a business house, it has been decided to charge 1s. 6d. per quarter for additional meters when more than one is required for a private house service, and more than two are required for services to business premises.

MARYLEBONE.—The B.C.'s Finance Committee recommends application to the L.G.B. for sanction to a loan of £5,450, to cover expenditure on mains, including this year's expenditure.

The E.L. Committee has arranged suitable accommodation for, and come to an agreement with, Edison Accumulators, Ltd., whereby the latter for five years will carry out the charging of all vehicles brought to the Council. The company agrees to take 100,000 units during the first year, and not less than 250,000 units a year subsequently, excluding energy used at premises other than the generating station, Blandford Street and Rathbone Place. The prices quoted by the Council vary from ½d. to ¾d. per unit.

HAMMERSMITH.—The Electricity Committee in reporting on the proposed linking up scheme with Fulham and Battersea B.C.'s., points out that the Battersea B.C. must meet certain large additional demands for electricity in the immediate future, and this can only be done, the Committee is informed, by an extension of the Battersea existing station or by putting into operation at an early date the proposed linking-up scheme.

The Committee recommends approval in principle of the scheme subject to the necessary consents being obtained and to a satisfactory agreement being entered into.

Market Drayton.—PUBLIC LIGHTING.—The U.D.C. has decided to ask the local Electric Lighting Co. for its terms for lighting High Street and Shropshire Street, and converting the lamps.

Melton Mowbray.—The Electricity Co. has applied to the B. of T. for permission to use 200-volt overhead lines in the town.

Middlesbrough.—The L.G.B. has sanctioned borrowing powers to cover expenditure for laying electricity mains to works engaged on making munitions, but not for supplying electricity to ordinary consumers.

Rawdon.—E.L. SCHEME.—The D.C., after considering the report of the conference of the local Wharfedale authorities regarding the provision of electricity for the district, has decided not to join in the scheme.

Restricted Lighting.—The following additional regulations regarding lighting appeared in the *London Gazette*:—

The Secretary of State may order that all lights shall be extinguished or obscured between any hours, and within any area, and if no police constable is available to see that the order is obeyed, "any soldier or sailor on sentry patrol, or other similar duty," may enter premises, or stop and seize any vehicle to extinguish or obscure the lights.

No coloured lamp may be carried on any vehicle other than a locomotive or railway carriage without lawful authority, unless such light is already authorised by law. Lights carried in vehicles are not to be capable of movement "independent of the movement of the vehicle."

St. Annes-on-Sea.—PRICE INCREASE.—The U.D.C. has decided to increase the price of electricity for private lighting by one halfpenny per unit, and to add 10 per cent. to the price of current for all other purposes except cooking.

Salford.—PROPOSED NEW PLANT.—The question of the supply of a 5,000-KW. turbo-alternator at the Frederick Road electricity station, at an estimated cost of £16,200, is under consideration.

Sheerness.—L.G.B. INQUIRY.—An inquiry was held on June 8th into the application of the U.D.C. for a loan of £5,000 for the extension of the refuse destructor. There was no opposition.

Shipley.—PRICE INCREASE.—From July 1st the charge for electricity for lighting purposes will be 4¾d. per unit, and for power purposes the present charges are to be increased 10 per cent.

Slaithwaite.—E.L. SCHEME.—The Council has decided, owing to the fact that the L.G.B. has intimated that it is not prepared to sanction any loans for public works during the war, and on account of the abnormally high prices of labour and materials, that the electric lighting scheme for the district should be temporarily suspended.

Stratford-on-Avon.—The Electricity Co. has asked the T.C., in view of the increased cost of coal, labour, &c., to allow it to charge a maximum of 6d. per unit for current instead of 5d. as per an agreement with the Corporation, although it was proposed at present to charge consumers only 5½d. The Council has referred the matter to a Committee, who will go into the agreement and report.

Teignmouth.—PROV. ORDER.—The B. of T. has issued a prov. order for E.L. to Messrs. J. W. and A. Purves, and the U.D.C. has decided not to oppose the confirming Act.

United States.—The *Daily Chronicle's* New York correspondent says a wide conspiracy exists to destroy plants in event of trouble between Germany and America, and the American Government has warned munition manufacturers to have their factories heavily guarded. Some have already electrically-charged wire fences 6 ft. high erected around them.

Walsall.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking show a profit of £1,385; a sum of £1,012 is transferred in respect of obsolete plant. The Electricity Committee recommends that this profit should be applied in reducing the debt on switchgear and plant to be superseded on the completion of the new station, and also to carry forward £639.

NEW POWER STATION.—In view of the slow progress at the Birchills power house, together with other circumstances consequent upon the dislocation caused by the war, the Electricity Committee has considered the question of how to meet the demand during the coming winter, in the event of the new plant not being ready. The Committee has decided that no further plant be provided at the Wolverhampton Street works.

Warminster.—E.L. SCHEME.—Mr. J. H. Edwards, promoter of the E.L. scheme, has informed the U.D.C. that the parties interested in the matter are not able at present to decide definitely as to the site for the generating station, and are unwilling to bind themselves in any way at the present time.

Watford.—PRICE INCREASE.—The U.D.C. has, owing to the enormous increase in the price of coal, advanced the price of current for lighting by 12½ per cent., and for power, &c., by 10 per cent.

Wimbledon.—In regard to the B.C.'s application for permission to supply electricity to 18 houses in the parish of Cuddington, and in the Epsom Rural District, the B. of T. is not prepared to make an order under the section in respect of such a large number of premises, and suggests that the Corporation should apply for a prov. order to extend its present area of supply.

Yarmouth.—YEAR'S WORKING.—The annual accounts of the Corporation Electricity Department for the year ended March 31st, 1915, show a gross profit of £9,250. After payment of interest and oustanding charges of £8,630, £188, the final instalment of the cost of the mechanical stokers and the alteration of the system of street lighting, there was a net profit of £432, which was carried to the appropriation account.

The Electricity Committee has reduced by one-third the charge of £591 for street lighting.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—YEAR'S WORKING.—The total revenue for the past year of the Corporation tramways was £87,986, and the increase, as compared with 1913-14, was £2,722. The number of passengers carried was 22,866,761, as against 20,966,394, an increase of 1,900,367, allowance being made for soldiers' free tokens. The miles run numbered 1,907,377, against 1,832,587.

Bolton.—In connection with the movement of local tramway workers to secure advances of wages, the men have decided to ask the Tramways Committee to grant an advance of a ¼d. an hour in July, and a further ¼d. on January 1st next.

Bolivia.—According to information published by the newspapers of Bolivia, the construction works will shortly be taken in hand of the electric tramway from Yungas to La Paz.

Continental.—Italy.—A concession has lately been granted for the construction and working of an electric tramway between Turin, Sassi and Superga.

Dartford.—Messrs. Balfour, Beatty & Co., Ltd., have applied to the B. of T. for the time for the completion of the tramways under the 1911 order, to be prolonged until August 18th, 1918.

On the advice of the engineer-in-chief, the Metropolitan Asylums Board has approved of the installation of certain points and crossings for a projected siding of the tramway system at the Joyce Green Hospital.

Hove.—Railless Traction.—The T.C. is recommended to agree to an extension of time for completion of the through railless system until two years after the termination of the present war, and that the conditions resulting from the Brighton and Hove Acts of 1912 be extended over the period named.

London.—The L.C.C. Highways Committee is giving careful consideration to the case of those employés who remained loyal during the strike. During the four weeks ended June 2nd, the number of passengers carried was 25,789,651, as against 42,025,436 in 1914, a decrease of 16,235,785. Traffic receipts amounted to £109,547, as compared with £178,848, showing a decrease of £69,301.

The Select Committee of the House of Commons has passed the L.C.C. scheme for extending the existing tramways from the Aldgate terminus, down Mansell Street, and across Tower Bridge approach to Tower Hill, terminating by a loop round Trinity Square.

The Highways Committee recommends that the arrangement made in July, 1913, that any surplus from the working of the Council's tramways should be paid into the renewal fund, be extended for a further period of two years from April 1st, 1915; also that the basis of the provision to be made be reconsidered at the end of that period.

Quarry Bank.—The Quarry Bank and District Light Railways (Transfer) Order, 1912, expires in August, and Messrs. Balfour, Beatty & Co. have informed the U.D.C. that circumstances have rendered it impossible for them to proceed with the scheme, and that in view of present conditions it is inadvisable to apply for an extension of time in view of the unlikelihood of them being able to deal with the matter in the future. The Council has referred the matter to the Brierley Hill, Quarry Bank and Rowley Regis Light Railways Joint Committee.

Northampton.—Year's Working.—The accounts of the Corporation tramway undertaking for the year ended March 31st show that after the payment of interest and instalment of loans there was a credit balance of £1,581, of which £651 has been placed to the reserve fund. The sum of £5,000 is to be debited to the reserve fund, now standing at £11,420, and credited to the unexpired loans for the original Kingsthorpe system prior to the Kingsthorpe and Far Cotton extensions.

Sunderland.—The reserve, renewals and compensation funds of the tramways department now amount to £45,044, the sum of £4,064 having been added during the year. There has been a falling off in the receipts during the last two months of £503, equal approximately to £3,018 per annum. Altogether 83 of the employés have left to join the military or naval service or to engage in war work.

Tottenham.—It has been suggested that the D.C. should enter into an agreement with the Metropolitan Electric Tramways, Ltd., as to the repair and maintenance of the tracks in Tottenham under the jurisdiction of the company. The General Purposes Committee of the Council has instructed the clerk to negotiate with the Tramways Co accordingly.

Walsall.—The Corporation Tramways Committee recommends the purchase for £900 of land adjacent to the Corporation tramways depôt from the Birchall's Estate Co., as a site for a depôt for the motor-'bus service.

Yarmouth.—Year's Working.—The report of the Corporation tramway undertaking for the year ended March 31st last, shows a gross profit of £5,706, as compared with £8,631 in the previous year; loan charges, &c., amounted to £7,041, leaving a deficiency of £1,294.

TELEGRAPH and TELEPHONE NOTES.

Adriatic Cables Cut.—On June 5th the cables uniting the Continent to the islands of the Dalmatian Archipelago were cut by the Italian Navy.

Argentina.—A new company which has just acquired the generating station at Jujuy intends to reconstruct and extend the telephone network in that province. The capital town is to be placed in communication with the departments to the east and west, affording connection with Perico del Carmen, San Pedro and Ledesma.

France (Algeria).—The Chamber of Commerce of Algiers has been authorised to lend a sum of £2,976 to the Government-General of Algiers, in order to establish a telephone system between Warnier, Malakoff, Masséna, Lamartine, Beni-Indel and Bou-Caid.—*B. of T. Journal.*

Illicit Wireless.—A school teacher named W. R. Walker was charged at Castle Eden Police Court, Durham County, on Saturday last, with being in possession of wireless telegraphic apparatus at Trimdon Grange. The defendant, who had informed the Post Office in August last that he had wireless apparatus (which was dismantled at the outbreak of the war), was fined £5 5s.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Melbourne.—Aug. 11th. One 1,000-kw. D.C. generator complete, liquid starter, &c., for City Council. See "Official Notices" June 4th.

Adelaide.—July 14th. Galvanised-iron wire, for P.M.G.'s Department. See "Official Notices" June 4th.

Sydney.—July 19th. City Council. Fuses and fuse-boxes. City Electrical Engineer (10s. 6d.).

Basingstoke.—Installation of electrical plant, including engines, dynamo, battery, cables, &c., at Park Prewett Asylum. See "Official Notices" to-day.

Bolton.—June 23rd. Corporation. 30,000 tons of bituminous engine slack, nuts, or peas, for the Electricity Committee. Forms of tender from Mr. W. J. H. Wood, Borough Electrical Engineer.

Brighton.—June 22nd. Electrical fittings, for the Board of Guardians. Particulars from Mr. H. Burfield, Clerk, Princes Street.

Dublin.—June 21st. Installation of electric light at the Technical Schools, Rutland Square, for the Education Committee. Particulars from Mr. J. Clark, Technical Institute, Bolton Street.

Eastbourne.—June 26th. 160 ft. of 14-in. cast-iron circulating water piping and valves. See "Official Notices" June 11th.

Edinburgh.—June 21st. Two 5,000-kw. turbo-alternators and condensing plant, for Portobello supply station. See "Official Notices" May 21st.

Erith.—July 5th and 19th. U.D.C. One water-tube boiler with superheater, economiser, automatic stoker, steel chimney, induced-draught plant, steam valves, steam pipes, and all auxiliaries. One 2,000-kw., h.p. turbo-alternator, with condensing plant, switchgear, and all accessories. See "Official Notices" to-day.

Exminster.—June 29th. Electrical appliances for a year, for Devon County Lunatic Asylum. Mr. H. E. Morgan, Clerk.

Glasgow.—June 19th. School Board. Installation of electric light at Springbank Public School, Henshaw Street. Specification from the School Board offices, 129, Bath Street.

Halifax.—July 1st. Corporation. One 5,000-kw. turbo-alternator complete with condenser; two natural-draught chimney-type cooling towers; one water-tube boiler, superheater and mechanical stokers. See "Official Notices" to-day.

London.—Metropolitan Asylums Board.—June 30th. Lighting installation at the Grove Fever Hospital, Tooting Graveney, S.W. See "Official Notices" June 11th.

Fulham.—June 30th. 11,000 tons of coal, for the Borough Electricity Works. See "Official Notices" June 11th.

Nottingham.—June 24th. Twelve months' supply of coal for the Corporation generating stations. Mr. H. Talbot, Electrical Engineer.

Rangoon.—August 11th. Installation of a system of fire-alarms, for the municipality. Specification (10s.) from Messrs. Ogilvy, Gillanders & Co., 67, Cornhill, E.C.

Rochford.—The B. of G. is recommended to invite tenders for the installation of a system of electric bells, indicators, &c., at the infirmary.

Salford.—June 28th. Supply of stores, including cable, &c., for the Electricity Department. See "Official Notices" to-day.

Spain.—The Spanish Ministry of Posts and Telegraphs, Madrid, is inviting tenders for the establishment and working, during a period of 20 years, of telephone exchanges in the towns of Monforte de Lemches (Province of Lugo), Guadix (Granada), Betanzos (Coruna), Durango (Vizcaya), Cabeza de Buey (Badajoz), Haro (Logrono), Tudela (Pamplona), Vinaroz (Castellon), and Baza (Granada).

Tenders have lately been invited by the municipal authorities of Pinille del Toro (Province of Zamora) for the concession for the electric lighting of the town.

July 31st. The Spanish Ministry of Public Works in Madrid is inviting tenders for the concession for the construction and working of an electric tramway between Mongat and Tiana (Province of Barcelona). An application has already been made for the concession, but, in accordance with the usual custom in Spain, the project is being put up to public tender.

Tasmania.—LAUNCESTON.—July 26th. Sub-station equipment. Section I, Converter machine, switchgear, &c.; Section II, Underground feeder cable. Specification (21s.) from the City Electrical Engineer, Town Hall.

Walsall and West Bromwich.—July 5th. Lighting; heating apparatus; drainage and septic tanks, for Unions Joint Committee. See "Official Notices" to-day.

Warrington.—June 18th. E.H.T. cable, for Electricity and Tramways Committee. See "Official Notices" June 11th.

Wigan.—June 21st. Corporation. Two water-tube boilers with mechanical stokers. See "Official Notices" June 11th.

CLOSED.

Australia.—SYDNEY.—According to the *Sydney Sun*, the City Council received the following tenders:—

Incandescent lamps.—
Aust. General Electric Co.—Vacuum, £868 15s.; nitrogen, £3 15s. 3d.
Do. do. —Alternative A: Vacuum, £918 15s.
Lawrence & Hanson.—Vacuum, £957 5s. 10d.; nitrogen, £2 12s.
British General Electric Co.—Vacuum, £1,119 10s.
Aust. General Electric Co.—Vacuum, £1,343 12s.
British General Electric Co.'s tender recommended for acceptance for vacuum lamps; Aust. General Electric Co.'s tender for nitrogen lamps recommended for acceptance.

Coal schutes.—

W. Elder & Co. ..	.. £280	Watt & Murdoch	.. £436
Storey & Keers ..	.. 312	James Connolly	.. 582

W. Elder & Co.'s tender recommended for acceptance.

The following contracts have been placed:—

N.S.W. Railways and Tramways Department.—
Quadruple turntable for White Bay power house, £549.—H. Vale & Sons.
Metropolitan Board of Water Supply, Sydney, annual contracts.—
Electrical conduit.—W. G. Watson & Co., Ltd., 32½ per cent. below schedule.
Electrical sundries.—Lawrence & Hanson Electrical Co., Ltd., 15 per cent. below schedule.
Electrical wires and cables.—W. T. Henley's Telegraph Works Co., Ltd., 7½ per cent. below schedule.
South Gippsland (Vic.) Creamery & Butter Factory, Ltd.—
Generator, three-machine booster, switchboard, 140-amp.-hour Chloride battery of 125 cells, cables, &c., £751.—Sutherland & Ashman.
—*Tenders.*

Barnet.—In connection with the installation of electric light at the Nursery, the Guardians have accepted the tender of Messrs. Baxter & Caunter for the supply of the necessary material, at £35. The actual work is to be entrusted to the Board's engineer.

Barnsley.—The Electricity and Lighting Committee has accepted the following tenders for coal:—Mr. R. E. Williams, 3,250 tons; Messrs. J. Wilby, Ltd., 3,250 tons.

Carlisle.—The T.C. has decided to renew for a period of 10 years, at £55 per annum, the agreement with the Tudor Accumulator Co., Ltd., for the maintenance of the lighting battery at the electricity works.

Chesterfield.—The T.C. has accepted the following tenders for plant for the electricity works:—
British Westinghouse Co., Ltd.—400-KW. alternator, &c., £877.
Babcock & Wilcox, Ltd.—Boiler, £997; superheater, £195; mechanical stoker, £280.
Clay Cross Iron Co., Ltd.—Economiser, £359.

Croydon.—The Lighting and Electricity Committee recommends that contracts be entered into with the following firms:—
J. H. Gilman & Co.—3,000 tons Kingsbury Ryder beans, 24s. 10d. per ton; 2,500 tons Mapperley small nuts, 25s. 6d. per ton; 3,500 tons Portland and Linby slack, 23s. 6d. per ton.
Cleeves & Co.—3,000 tons of Shipley peas, Manners peas, Mapperley small nuts and Manners small nuts, 25s. 6d. per ton.

Darlington.—The T.C. has accepted the following tenders for the electricity works:—
Cochrane & Co., Ltd.—Condensing water pipework.
British Thomson-Houston Co., Ltd.—H.T. switchgear.
Musgrave & Co.—Induced-draught fan.

Gosport.—The contract for the installation of the electric light at the new Girls' Hostel, Milton, has been secured by Messrs. W. N. Walters, of Gosport.

Gravesend.—As the Western Electric Co. is unable to supply cables under the schedule contract prices, the T.C. has decided to obtain quotations from that company and from Messrs. Henley's, Ltd., and to accept the lowest.

Heckmondwike.—The U.D.C. has sealed a contract with Mr. F. E. Moss for 2,000 tons of coal for the electricity works.

London.—BERMONDSEY.—The Electricity Committee recommends the purchase of 2,000 tons of Mansfield nutty slack from Messrs. Usher & Co., at 19s. 9d. per ton, and 1,200 to 2,000 tons of Shipley nuts from Messrs. Myers, Rose & Co., at 22s. 6d. per ton.

HAMMERSMITH.—The Electricity Committee reports that up to the present the Council has authorised the Committee to purchase and store up to a maximum of 6,000 tons of coal; orders to the amount of 3,850 tons have been placed. The Committee is of opinion that full advantage should be taken of the coal-storage facilities now in working order at the generating station by maintaining a more adequate reserve than the present authority permits, in order to avoid possible contingencies, and recommends the Council to accept the following offers:—
Cory Bros. & Co., Ltd.—2,000 tons of Gedling ½-in. High Hazel slack, at 17s. 9d. per ton.
Harrison.—3,000 tons of the coals submitted, at 18s. 7d. per ton.

G.P.O.—The tender of the Edison & Swan Co. for a six months' supply of "Royal Ediswan" (tungsten) drawn-wire lamps has been accepted.

The tender of the Alpha Manufacturing Co. has been accepted by the Metropolitan Asylums Board, at £32, for installing electric radiators at the head office, Embankment, E.C.

Lowestoft.—The E.L. Committee recommends the acceptance of the tender of Messrs. Bradbury, Son & Co., Ltd., for the supply of 500 tons of coal, at 19s. 2d. per ton; also that of Messrs. Kaye, Son & Harper for 2,000 tons, at 19s. per ton.

Manchester.—The Corporation has placed an order with Messrs. Ed. Bennis & Co., Ltd., for four complete chain-grate stokers, each 8 ft. by 14 ft., for the new B. & W. boilers recently installed in the electricity station.

Meter Contracts.—The Stoke-on-Trent Council has placed a portion of its contract for D.C. meters for 12 months with the Electrical Apparatus Co., Ltd. Messrs. Chamberlain and Hookham, Ltd., have also received a contract from Stoke-on-Trent for meters for the coming year.

Salford.—The T.C. has accepted the offer of the British Westinghouse Co. for a 5,000-KW. turbo-alternator at the electricity station, Frederick Road, for £16,200. At a special meeting held on Wednesday it was stated that last October the Council authorised the acceptance of an offer of a 5,000-KW. turbo-alternator from a Rugby firm, but the latter had since intimated their inability to complete the contract in time for next winter's load. It was necessary that plant should be obtained, and that was why the present proposal was made.

Southend-on-Sea.—In reference to the tender recently accepted by the Council for an overhead travelling crane required for the new sub-station, the contractors having stated that they are unable now to supply these cranes at the amount of their tender, the Committee has decided that only the one crane required at the Leigh sub-station be purchased at the present time. The tender of Messrs. F. Carrick & Sons, at £167, is to be accepted. The Corporation is recommended by the Light Railways Committee to accept the tender of Messrs. Edward Le Bas for a half-mile of overhead trolley wire, at 11¾d. per pound.

Swansea.—The tender of the British Westinghouse Electric and Manufacturing Co., Ltd., has been accepted by the Electricity Supply Committee for a 250-KW. rotary converter, transformer and switchgear, at £970.

The offer of Messrs. J. R. Davies & Co. to supply coal to the electricity station at 20s. 6d. per ton, for a period of nine months, has been accepted.

Wolverhampton.—The T.C. has accepted the following tenders:—
Underfeed Stoker Co., Ltd.—Automatic stokers for No. 9 boiler at the electricity works, at £600.
Holly Bank Coal Co., Ltd.; W. H. Bowater, Ltd.; and W. Harrison, Ltd.—Fuel for the electricity works.
Brentnall & Cleland.—Coke-dust fuel for the electricity works.

FORTHCOMING EVENTS.

Incorporated Municipal Electrical Association.—Friday, June 18th. At Institution of Electrical Engineers, Victoria Embankment, W.C. At 9.30 a.m., Council Meeting; 10 a.m., Annual General Meeting.

North of England Institute of Mining and Mechanical Engineers.—Saturday, June 19th. At 2 p.m. At Wood Memorial Hall, Newcastle-on-Tyne. General Meeting.

Physical Society.—Friday, June 25th. At 5 p.m. At Imperial College of Science, South Kensington, S.W. Papers on "A Theory of the Electrical Resistance of Metals," by Sir J. J. Thomson, and on "An Unbroken A.C. for Cable Telegraphy," by Lieut.-Col. Squier.

REVIEWS.

Electric Mine Signalling Installations. By G. W. L. PATERSON. London: Constable & Co. Price 4s. 6d. net.

The author's aim is to provide a book useful to practical men engaged in mine signalling work. Bearing this in mind, we believe he has devoted too much space to very elementary matter and not enough to types of apparatus, their installation and maintenance. Nothing is said concerning the avoidance and treatment of "troubles," but these topics are of prime importance to the practical worker. The first half of the book might profitably be condensed, leaving more space available for the treatment of complete signalling circuits and equipment. In Chapter II, the internal construction of the enclosed ringing keys and tappers should be illustrated in the interests of students or beginners, to whom this and the following chapters will chiefly appeal. The action of bells, signal alarms and relays is described very fully in Chapter III, which is admirably illustrated. The average colliery electrician can hardly need such detailed treatment of this elementary topic, and would surely prefer to see more space given to the special methods, problems, and apparatus of mine signalling. Some of the indicators mentioned in the earlier pages of Chapter IV cannot be considered suitable for present-day use, and the description of some of the more modern types should be amplified. Chapter V dealing with electric generators, transformers, rectifiers, and accumulators for mine signalling circuits is very satisfactory, but the next chapter, on primary cells, occupies 29 pages and should be shortened considerably, particularly since the use of these cells is becoming less common in up-to-date installations. In Chapter VII the author describes and illustrates clearly the different arrangements of signalling circuits available, but does not sufficiently emphasise the fact that visual shaft signalling is now compulsory in this country. The rule on this point is given in the appendix, but its effect in restricting the choice of apparatus is overlooked. Several very reliable signalling systems complying with the latest rules are not mentioned. The chapter on engine plane signalling is very useful, as, too, are those on shaft and engine plane signal wiring. The collection of English and American Rules in the appendix, and of symbols for mining map circuits, &c., deserves mention. The production and indexing of the book are excellent, and by curtailing the elementary sections and amplifying those of more "special" nature, the author could easily convert this into a manual indispensable to the colliery electrician. At present the book is rather dear.

Model Answers to Test Questions in Wireless Telegraphy. Series 1 and 2. London: The Wireless Press. Price 1s. each set (net).

Series 1.—This little book of answers is a thorough and painstaking attempt to get the very best out of the series of test cards that we reviewed in our issue of January 8th.

The answers are very full, and although a little conversational in places, there can certainly be no better answer to the question: "What happens when a piece of rubbed sealing wax is brought near some small pieces of paper?" than "Try for yourself; you may find out something which is not mentioned in any text-book."

The Model Answers to Series 1 naturally suffer on account of the defect noted in the cards, viz., a lack of sequence. This inevitably leads to repetition in the answers, and results in such anomalies as the reference to T and L aerials on page 40, and their description and illustration on page 72. There are also a number of minor errors. π is used instead of λ, and there is a muddle in the variations of the $v = n\lambda$ formula on page 31; "97" should read "96" on page 32, and in the answer to question 102, "frequency proportional to $1\sqrt{\text{length}}$" should be "frequency proportional to $1/\sqrt{\text{length}}$." The diagrams are in some cases microscopic. The best answers are those on Changes of Energy, on page 59; Magnetic Detectors, on page 71; and Aerials, on pages 71 to 75.

Series 2.—The answers to this series are insufficiently illustrated; the only section to which this does not apply is that on Aerials. There is too much reference to Hawkhead's Manual for diagrams, and there are futile attempts to describe such apparatus as Wimshurst machines, electroscopes, and cells without the aid of any diagrams at all. The sections on Resistance, &c., and the more technical answers to Cards 22 to 47 are, however, much more satisfactory.

The student who writes conscientious answers to the test questions and then refers to these Model Answers, cannot fail to gain a sound knowledge of wireless telegraphy. At the same time, he will learn how to express himself clearly and scientifically—a by no means small achievement.—P. H. S. K.

NOTES.

Water-Power Utilisation in Sweden.—The annual Year Book of the Swedish Chamber of Commerce in London, just issued, contains an article on the subject of the utilisation of water-power in Sweden. It is based partially on an article by Mr. W. Borgquist, which recently appeared in the *Teknisk Tidskrift*, and partly on a pamphlet issued by the Swedish Water-Power Association.

According to the Swedish Board of Trade statistics, water-power was estimated in 1912 at 60-65 per cent. of the total effective power, but as water-power is used, on an average, for a longer period than steam power, the actual value may be put at 80 per cent. The figures show its importance in the question of power economy in Sweden, and the extent to which the country has made itself independent of imported fuel.

It is only during the last 10 or 15 years that water-power has been brought largely into use, *i.e.*, since the technique of power transmission became more generally known. The newly-established electrochemical and electrothermal industries are practically dependent upon an ample supply of electrical energy generated by water-power. Among the most important power stations in Sweden, from south to north, are the following:—

	H.P.
South Swedish Water Power Co.	27,000
Hemsjo Water Power Co.	10,280
Yngeredsfors Water Power Co.	16,250
Trollhattan (State-owned, to be extended to 110,000-120,000 H.P.)	80,000
Gullspang-Munkfors Water Power Co.	16,950
Guldsmedshytte Co.	6,750
Virsbo-Ramnas Water Power Co.	3,045
Untra Water Power Works (still under construction, belonging to the City of Stockholm) ...	42,000
Alfkarleby Water Power Works (State-owned; to be completed during the present year)	45,000
Horndals Ironworks Co.	8,000
West Dal River Water Power Co.	19,200
Graningeverkens Co.	9,150
Klabbole	4,525
Finnforsen	9,400
Sikfors	5,000
Porjus (State-owned)	50,000

As regards water-power plants erected exclusively for industrial purposes, the following may be mentioned as being amongst the largest:—Uddeholms Co., in Vermalnd Province, about 35,000 H.P.; Stora Kopparbergs Bergslags Co., on the Darlecarlia River, about 50,000 H.P.; Stockholms Superfosfat Co., on the Ljungan River, at Wansbo, about 30,000 H.P.; Alby Waterfalls Co., on the Ringdalsforsen River, and at Alby, about 15,000 H.P.

Among the new plants recently completed and at present in course of erection, it may be mentioned that the first turbine at the Porjus station was started in October last, and during the following month the first ore train was driven through the Lapland fields by electrical energy supplied from the Porjus station. The State-owned Alfkarleby Water Power Works, in the North of Sweden, is rapidly approaching completion, two of the large turbines being ready at the end of the past year. As regards the well-known Trollhattan plant—the largest in the country—the Government last year decided to increase this to the extent of a further 30,000-40,000 H.P.; when the new work now in hand is finished, the water-power utilisation plant in Sweden will represent an aggregate of 915,000 H.P., or approximately 15 per cent. of the total resources of the country. About 2,500,000 H.P. can be obtained from falls in Northern Sweden, which is, however, but sparsely populated. The falls in that part of the country are, therefore, proportionately more expensive to harness than those in Central and South Sweden.

So far as the new plants actually completed in 1914 are concerned, these represent a total of approximately 40,000 H.P., divided as follows:—Iron and mining industries, 15,000 H.P.; timber, wood pulp, and paper trades, 15,000 H.P.; textile industry, 1,000 H.P.; various other industries, 9,000 H.P.

Municipalisation of Electricity Works in Russia.—The *Novoie Vremya*, commenting on the repeated discussions in the Petrograd Town Council respecting the proposed purchase by the town of the electric enterprises, observes that two sittings have already been devoted to this question, and that it still remains in obscurity. A special Committee has considered it, and the opinions of its members are divided. The conclusions of the experts are also divided. Prof. A. V. Wolf believes it advantageous to buy up all three concerns; Engineer M. N. Lovitsky thinks it undesirable to buy out the Belgian company and the former Helios company, because their construction and equipment do not correspond to the level of efficiency reached by the industry at the present time. The best technical installation is that of the 1886 company, and if that is bought out—is it Swiss? Notwithstanding the divergent views of informed and competent authorities, one group is decided on the purchase of all three concerns, and apparently no words of the independent members will move them from their decision, or to make fresh inquiries. Prof. Zagoreky, whom they support, insists on the purchase of all three. According to him, the competition of the town with poorly equipped electrical companies will be unprofitable—not for the companies, but for the town.

The paper quoted says that the inhabitants require cheaper electrical energy, and advantage must be taken of the opportunity, though it would be unprofitable to buy out all three companies. The town should rather extend its own electric station, but this, in the opinion of the present majority of the town Duma, is equivalent to the renunciation of cheap electric power in the coming years. There remains only one issue—to buy the best equipped concern, the 1886 company. The question of the acquisition of this concern may be simplified in the near future. If the mask of Swiss proprietorship be torn from the company and the real enemy, Germany, made to appear, the business of the company can be liquidated and the concern be passed into the possession of the town without compensation.

A note from Moscow says that the management of the 1886 Electric Co. has announced to the Moscow Town Council that the Moscow electric station is working exclusively with petroleum fuel, and requires from 13,000 to 18,000 poods of petroleum residue per day. Such fuel had been bought for 1915, and for a considerable part of 1916, but owing to the existing exceptional position of affairs, when both coal and petroleum are scarce, and even wagons for carrying them, the company fears that it will not receive the necessary quantity of liquid fuel to carry on its business. On the other hand, if the station were to cease the use of oil fuel, at all events, there would be a possibility of more for the other industries in the Moscow district that require such fuel. The memorandum points out that even before the war the Electricity Transfer Co., in which the 1886 company is interested, began to work the peat deposits of the Bogorod district in the Moscow Government, and built there a central electric station which, amongst other objects, was intended to supply power for Moscow produced from peat. Up to the present time the company has spent 11,000,000 roubles on its plant, and is exploiting the peat reserves on a large scale.

The supply of Moscow with electric power, generated by means of peat fuel, is both of local and Imperial interest, and the effect of it should be to reduce the price of fuel in the Moscow district. This delivery of energy into Moscow from peat should be of particular importance at present in relieving the pressure on the railways, and the appearance of cheap energy in the district in such a convenient form as electric power delivered by conductors without any call on the railways, must correspondingly further the interests of the Moscow industries and residents.

Hitherto the Moscow Government has contested the right of the company to use current generated from the Bogorod peat for Moscow, because the agreement between the town and the 1886 company does not provide for the purchase of energy from outside. And although the company takes its stand on another point of view—that what the contract does not prohibit may be permitted—it is observed that until the Moscow market had experienced an extreme scarcity of fuel or great difficulties in its conveyance, the company abstained from using electricity generated from the Bogorod peat, but carried out experiments with the object of learning the technical possibility of transmitting current over a distance of 75 versts to the Moscow cable system. The crisis that has arisen in coal, petroleum, and wagons, constrains the management of the company to raise afresh the question of the use of energy generated from the peat of the Moscow district.

The request referred to has met with resolute opposition in the Moscow Town Council. The chief of the town, M. N. Chelnokoff, making use of the company's declaration of its difficulties, agitated once more for the transfer of the station to the control of the town, which he believes is capable of ensuring its uninterrupted working.

Water-Power in New Zealand.—The New Zealand Official Year Book for 1914 contains the following particulars of the water-power available throughout the Dominion. The Public Works Act of 1908 vests the sole right to use the water-power of the Dominion in the Crown, subject to existing rights. The right in the case of local authorities is issued free of royalty, and in the case of private individuals, subject to a royalty of $\frac{1}{20}$d. per unit generated.

A large and comprehensive scheme is now under consideration for the supply of electrical energy in the North Island, with the object of making it generally available, as far as possible, to all the towns and districts throughout the Island, and it is anticipated that advantage will be taken of the facilities offered to work the railways by electricity, and to promote a system of light railways throughout the country districts now suffering from lack of communication because of the difficulty of obtaining stone for surfacing the roads. In all there are 24 different sources of power in the North Island and 48 in the South Island.

The following table shows the actual horse-power in use in the various districts in 1913:—

	1913.
Auckland	13,640
Hawke's Bay	—
Taranaki	2,782
Wellington	389
Marlborough	202
Nelson	680
Westland	3,662
Canterbury	1,167
Otago	10,617
Southland	1,817
Total	34,956

An analysis of the purposes for which this water-power was employed on July 31st, 1914, shows:—Mining, 3,159 H.P.; electricity supply, 25,989 H.P.; flax mills, 511 H.P.; saw mills, 262 H.P.; flour mills, 412 H.P.; dairying, 783 H.P.; construction work, 721 H.P.; freezing works, 1,200 H.P.; paper mills, 465 H.P.; miscellaneous, 1,454 H.P. Of the 34,956 H.P. of water-power now in use, 11,963 H.P. is distributed electrically for public supply from 13 power stations, eight operated by local authorities, one (Rotorua) by the Government tourist department, three (Stratford, Hawera, and Reefton) by private companies, and one by a private individual.

The details of these installations are:—Dunedin—C.C., 9,000 H.P.; Rotorua—380 H.P.; Hawera—E.L. Co., 400 H.P.; Stratford—E.L. Co., 150 H.P.; New Plymouth—B.C., 1,020 H.P.; Inglewood—B.C., 200 H.P.; Patea—B.C., 200 H.P.; Te Aroha—B.C., 255 H.P.; Akaroa—B.C., 45 H.P.; Taihape—B.C., 133 H.P.; Mangaweka—T.B., 47 H.P.; Brightwater—Private, 53 H.P.; Reefton, E.S. Co., 80 H.P.

The above data include no reference to the Lake Coleridge hydro-electric plant, the first section of which has now been successfully brought into use; ultimately 13,000 H.P. will be developed.—*New Zealand Shipping and Commerce.*

Stowmarket Explosion.—The report of Major A. Cooper-Key, H.M. Chief Inspector of Explosives, on the fatal explosion at a Stowmarket factory on May 10th, gives further particulars with regard to the circumstances. It states:—

"On the morning of the accident cordite M.D. was in course of manufacture. It appears that at the moment of the accident two men in the building were on the point of handing out to two bogie runners the bags of cordite paste for removal to the hand-mixing house. Before being placed on the bogie the bags are wiped down to get rid of the gun-cotton dust, and also to remove to some extent the water from the bottom of the bags due to their having been standing on a wet floor. In order to avoid the use of a loose implement of any kind this operation was done by hand, and not with a brush. It was a fine, dry, cold morning, and the two men in the building were wearing stout rubber overshoes, which would completely insulate them from electric contact with 'earth.' The bags were of rubber-impregnated canvas, a marked dielectric, and in the case at any rate of a man with a naturally dry skin the operation of wiping the bags would undoubtedly have the effect of generating in his person a statical charge of electricity which might well be sufficient to cause a spark to pass as soon as he should happen to 'earth' himself by touching an uninsulated article.

"This may perhaps appear at first sight to be a somewhat far-fetched explanation of the accident, but I am convinced it is the true one. Mr. Duff Grant, the managing director of the New Explosives Co., told me that when on a visit to Canada, where, with the temperature below zero, the air is frequently practically free from moisture, he proved by personal trial that by rubbing the feet on a thick pile carpet the gas could be lit by a spark from the end of the finger, and this not occasionally, but every time. When I mentioned this to the Messrs. Dupré they said that their brother, who has been in Canada for some time, told them that on cold, dry days it was a favourite joke at five o'clock tea parties to shuffle the feet on the carpet before handing a plate of sandwiches, with the result that the person helping himself would receive quite a considerable electric shock."

A case is also mentioned relating to a factory at Ardeer, where a workman wearing rubber shoes fired acetone vapour by a spark from his finger after merely allowing the thin strands of rifle cordite to pass over his hand.

It seems, therefore, that the Inspector's theory is well within the bounds of probability, though at first sight it might appear inadequate. The best safeguard apparently against such accidents would be the thorough ventilation of all buildings to prevent the accumulation of explosive mixtures of gas and air.

Magnetic Elements.—The report of the Astronomer-Royal shows that the mean values of the magnetic elements at Greenwich for 1914 were as follows:—Declination W. 15° 6′3″; horizontal force, 0·18518 C.G.S. units; dip 66° 51′ 13″.

Patents and Alien Enemies.—The Board of Trade has granted licences to G. H. Wilson, of the Manchester Armature Repair Co., in respect of patents Nos. 10,457/06, 2,711/10, 20,634/10, 9,941/11 and 27,651/12.

Coal Supplies.—A deputation representing the gas and electrical interests attended at the House of Commons on Wednesday, June 9th, and laid before a meeting consisting of about 200 Members of Parliament the serious difficulties which they were experiencing owing to the shortage of coal. Lord Claud Hamilton presided, and the speakers were Sir Corbet Woodall, Sir John Snell, Alderman Kay, Mr. F. Bailey, Dr. Charles Carpenter, Bailie Irwin, and Bailie W. B. Smith.

Attention was drawn by the various speakers to the seriousness of the shortage, which was due to several causes, among which was mentioned particularly the enlistment in the Army and Navy of a large number of miners. In addition, it was pointed out that a large proportion of coal was sent abroad, but a Committee had been appointed by the Government for dealing with the export of coal, and the effect of the work it had done was already apparent.

The question of the all-round necessity and utility of gas and electricity was urged at length. It was also pointed out that a number of gas and electricity undertakings had so adapted their plant that they were producing materials of vital importance to the Government, and, furthermore, that the residuals were necessary to a great variety of important industries. One large London gas company could increase their supply of these by-products by some 40 per cent. by using coal instead of oil for their gas production, and it was suggested that if the Government realised the importance of this aspect of the question they would help gas undertakings in every way to obtain supplies of coal.

Generally speaking, it was an absolute impossibility to take in sufficient coal during the winter for the winter's requirements, and therefore a large stock had to be accumulated during the summer months when the demand was not so heavy. This year it had, so far, been impossible to carry out this system, and if the stocks were not made up by the middle of October the public undertakings would be unable to continue their supply through the coming winter.

Various means of improving matters were suggested, amongst which were mentioned a limitation of further recruiting of miners, a suspension of the operation of the Eight Hours Day Act in respect of collieries in order to increase the actual output of coal, the fixing of a maximum rate of freight for all interned vessels, further facilities generally for the transport of coal, and a continued limitation of the export of coal. Finally, it was urged that if Members representing mining districts could induce their constituents to work full time, a large part of the difficulty of shortage would be overcome.

The meeting was adjourned till Tuesday last, when a committee was formed to consider the subject, and to formulate recommendations which should be laid before a later meeting. The Committee consists of 12 members, representing the coal-owners, the workmen, the great consumers, and the ship-owners :—

Colliery proprietors.—Sir Arthur B. Markham, Sir Alexander Henderson, and the Hon. H. D. McLaren.

Ship-owners.—Sir Walter Runciman, Mr. R. D. Holt, and Mr. R. P. Houston.

Workmen.—The Right Hon. Charles Fenwick, Mr. T. Richards, and Mr. B. Kenyon.

Consumers of coal.—Mr. W. Joynson-Hicks, Sir Daniel Ford Goddard, and Sir Corbet Woodall.

It is hoped that this Committee will be able to submit recommendations to the adjourned conference next Tuesday.

Automatic-Lift Accidents.—A correspondent using the pseudonym "Leeds" writes (too late for inclusion in our "Correspondence" columns) :—"Having read with much interest the correspondence of the last few weeks under the above heading, especially the letter of Messrs. Smith, Major & Stevens, which implies that the lift will not work with the gate open, that is, no doubt, correct as far as starting the lift is concerned ; but once it is started, should a fault develop on the controller (which is not an unknown occurrence), putting the switch-handle back to the off position in the cab, and opening a gate, will not stop the lift. It will continue in the same direction, bring out the 'tappet' switch, and finally come to the end of the lift run, and then blow the fuses. Now, it is possible for a person to jump out as the lift is passing one of the floors, perhaps with fatal results, and I contend that the gate locks do not cut off current in this instance. Is it not possible to wire up first to the gate locks and control the current to the motors ?"

Anti-German Riots on the Rand.—Our Johannesburg correspondent, writing on this subject under date May 14th, says :—

It would be foolish not to admit that the great leniency shown to enemy subjects by the South African Government probably had a good deal to do with yesterday's outbreak. The spectacle of Germans growing fat on South African trade, particularly in electrical engineering and its kindred branches, while many South Africans are sacrificing their lives and neglecting their businesses in order to fight the Germans, is an exasperating one. It forms a perpetual source of irritation to the public mind. And it is easily comprehensible that this should be the case. The destruction of business premises may be one method of showing detestation of German methods. It is, however, open to the objection that it may inflict, and in one instance here (*i.e.*, that of Siemens) has unfortunately inflicted, equally serious damage on Britishers, who may be actual owners of the premises. On the 11th inst. some little trouble occurred at the Brakpan power station of the V.F.P. Co. In connection with the construction work at present being carried out at this station, there were 16 men employed by Messrs. Reunert and Lenz, besides the fixed staff of the V.F.P. Co. On Saturday last the A.E.G. Co. took on four German workmen. It was a significant fact that after the *Lusitania* tragedy became known, six of the German employés knocked off work at 9.30 p.m. instead of midnight, while the British workmen belonging to Messrs. Reunert and Lenz, and another contractor, named A. Stewart, and the V.F.P. Co. completed their full shifts.

It is shrewdly suspected that the Germans left off work in order to celebrate the "most brilliant achievement" of their Navy.

The following evening the British workmen held a "council of war" and resolved that if the Germans still retained their jobs, they would refuse to go on shift. Eventually the whole of the German workmen were dismissed.

As previously mentioned, the Johannesburg branch of Messrs. Siemens, Ltd., was burnt to the ground by the rioters, notwithstanding the fact that the firm is a British one. It is true that before the war the Johannesburg firm of Siemens, Ltd., were the agents for the German firms of Siemens-Schuckert and Siemens Halske, and this probably was the immediate cause of the trouble. The members of the staff of Siemens, Ltd., published in the *Star* a protest against the damage done to the premises of a British firm.

The store of the A.E.G. Co., situated in the "City and Suburban" township, was attacked later and formed a centre of interest for some considerable time. Entering the yard, men and youths started operations by smashing up the doors and windows in a very complete manner. The building, of wood and corrugated iron, was next invaded, and fires were started at several points.

The stock, with petrol, &c., was of a most inflammable description, and the building was soon in full glow. Prior to this lamps were taken from the store and flung against the wall, causing miniature explosions, which afforded much entertainment to the crowd. Here it was useless to think of saving the premises, and they were entirely gutted, although it took a considerable time completely to destroy the buildings.

Russia.—H.M. Consul at Batoum, in a report to appear shortly, says :—"The trade in electrical machinery had very largely, if not entirely, fallen into German hands, but the activity recently exhibited by United Kingdom manufacturers should succeed in gaining a part of the trade for British-made goods."

Electrical Incubator Tests.—*The Aberdeen Daily Journal* mentions that the Poultry Department of the North of Scotland College of Agriculture has recently carried out tests with an electrical incubator and hover (or foster mother), which was supplied by Mr. M. K. Cooper, of Messrs. T. C. Smith & Co., Aberdeen. This incubator—of 50-egg capacity—is fitted with a patent thermostat for regulating the temperature and four 32-C.P. lamps ; the hover is fitted with two 32-C.P. lamps. Both are of galvanised metal throughout and simple in construction. In one test 31 chickens were hatched out of 40 fertile eggs, and in another 36 out of 39 fertile eggs. These results are equivalent to 77 and 92 per cent. respectively of chickens hatched from fertile eggs, which represent a comparatively high percentage for artificially hatched chickens. The effectiveness of the hover can be judged from the fact that 65 chicks were reared out of 67 ; it provides an even distribution of heat, preventing overcrowding of the chickens. To hatch and rear each lot of chickens 41 units were required (at 1d. per unit, cost 3s. 5d.). The raising of numbers of early spring chickens can only be done successfully by artificial incubation.

Educational.—Sir Philip Magnus was recently entertained at dinner by the Association of Technical Institutions, and was presented with an address on the occasion of his retirement from the active direction of the Department of Technology of the City and Guilds of London Institute, after 35 years' service.

The Mobilisation of Science.—The following question was put to the President of the Board of Education and answered on Wednesday, after we had closed our leading columns, in which we refer to this subject :—

Mr. Joseph Pease.—To ask the President of the Board of Education whether he proposes to carry out the scheme recently outlined for the development of research work and the better application of science to industry ; and, if so, when will he be in a position to announce the names of the advisory council.

Mr. Arthur Henderson.—I certainly hope to carry out the scheme initiated by my right hon. friend, and I hope to be in a position to announce the names shortly.

Fatalities.—NEWCASTLE.—Two men were killed by electric shock, late on Friday night, at the works of Messrs. Armstrong, Whitworth & Co. A worker, named Thomas Harrison, died immediately ; another, named Edward Babbs, did not get the full force of the current, but he died while being removed to the infirmary. Three other men were seriously injured by electric shocks. The workmen were engaged in the electrical department of the works. The inquest was formally opened on the 12th, and adjourned until June 23rd.

LONDON.—At an inquest held into the cause of death of a carman named Rocca, whose van skidded on an L.C.C. tramline while he was driving along Vauxhall Bridge Road, the police evidence showed that the tramrail was in an exceedingly bad condition, being worn away about an inch. The jury, in returning a verdict of "Accidental death," said that the L.C.C. was guilty of negligence in not keeping the line in proper condition.

ALDERSHOT.—An inquest was held by Mr. J. T. Coggins, Deputy Coroner, at Aldershot, on Saturday, on William Sutherland, 40, of Blyth, Northumberland, electrical wireman, employed by Messrs. Saunders & Co., York Street, London, electrical engineers, who died in the hospital on June 10th from injuries received in an accident at Pirbright Camp on June 7th.

The Coroner explained that deceased was carrying out certain work in connection with high-tension wires at the Camp. He was fixing cradles underneath the wires, to reach which he had to use a ladder. The wires were naked, but before any workman commenced performing such duties as those of the deceased, the foreman of the job would telephone through to the power station at Aldershot Camp and get the current cut off. The man might then proceed with the work in safety. It was thought that in some way or other deceased must have touched the wire, for he seemed suddenly to spring or throw himself away from the ladder and fall to the ground.

Charles Williams, foreman of the works, said deceased was working at a height of 26 ft., and the wire would be about 6 in. from the cradles underneath. Their instructions were not to proceed with the work until the current was switched off.

Asked whether he took any steps to let the man know that he had not got through, witness replied that he came out of the call box and put up his hands to show that he could not get through. When he put his hands up it meant stop.

Charles Payne said deceased had definite instructions not to proceed with the work until the current was switched off, and William Fisher, supervising engineer, also gave evidence as to the instructions.

Lieut. A. Ferguson, R.A.M.C., said the cause of death was fracture of the base of the skull. In reply to the Coroner, Witness said he should expect a man who had received an electric shock to be burnt, but he found no signs of such injury. Had deceased received a severe shock he would have been killed on the spot. The Coroner said the voltage was 3,000, but there was no real evidence that deceased touched the wire. It was possible that he might have received a slight shock which caused him to fall from the ladder. The jury returned a verdict that deceased died as the result of fracture of the base of the skull sustained by falling from a ladder.

Volunteer Notes. — ENGINEERING INSTITUTIONS' VOLUNTEER TRAINING CORPS.—On the suggestion of General Sir O'Moore Creagh, V.C., G.C.B., G.C.S.I., an Engineer Volunteer Corps has been raised from members of the engineering profession who are either above military age, or who, being of military age, are prevented by some good reason from serving in the Regular Forces.

The objects of the Corps are :—

1. To train men of military age and to make them useful Royal Engineer recruits if, and when, they are able to enlist.

2. To furnish Engineer units to assist in the completion of the Volunteer organisation.

3. To organise the Corps so that the maximum advantage may be taken of the specialised engineering skill of its members at the earliest possible moment.

Drill takes place through the kindness of Colonel le Rossignol and the officers of the London Electrical Engineers Corps at the Drill Hall, 46, Regency Street, Westminster. The training will be similar to that of the London Electrical Engineering Corps.

Although the first drill only took place on the 2nd inst., already 130 members are enrolled. Membership is not restricted to members of the Engineering Institutions, and application should be made to the Commandant, Lieut.-Colonel C. B. Clay, V.D., at Marconi House, Strand, W.C.

3RD BATT. (OLD BOYS) CENTRAL LONDON REGIMENT (VOLUNTEERS).—Battalion orders, by Colonel S. G. Grant (Officer Commanding), Thursday, June 17th, 1915.

465. WEEK-END PARADES.

Saturday.—"A" and "B" Companies will parade with North London Platoon at Enfield Railway Station (G.N.R.) at 2.30 p.m. sharp. Train from King's Cross Local (G.N.R.) at 1.41 p.m. Route march, and inter-company Shooting Competition at Enfield Rifle Club.

Order No. 456, in so far as it relates to "C" and "D" Companies, is cancelled. "C" and "D" Companies will parade at Baker Street Met. Station at 2.30 p.m., and proceed by train to Wembley Park.

Sunday.—6 a.m. Reveille.
10 a.m. Church Parade.
10.20 a.m. Battalion Parade.
2.15 p.m. Battalion Parade under Commandant.

467.—ENTRENCHING.—Men who have given in their names for above duty will parade each day at Liverpool Street Station (G.E.R. Low-Level Entrance), at 8.45 a.m.

For names of men detailed for each day see lists posted at headquarters and at Wembley Park. Uniform will be worn. Arms will not be carried. Men will provide their own rations.

A. J. JOINER, *Captain and Adjutant.*

Appointments Vacant.—Shift engineer (£2 15s.), for Fulham electricity department; teacher of Electrical Calculations and Drawing for Wiremen's Classes (10s. 6d. per evening), for Middlesex Education Committee; switchboard attendant for Middlesbrough Corporation; assistant engineer and car-shed superintendent, for Sunderland District Electric Tramways, Ltd.; switchboard attendant for Torquay Electricity Department; works fitter (£2 10s.) for Rhondda U.D.C. Electricity and Destructor Works. Particulars are given in our advertisement pages.

Late Legal.—RICKMAN *v.* F. W. BERK & CO., LTD.—In the Lord Mayor's Court on Tuesday, before Assistant Judge Jackson and a jury, a claim was made by Thomas Rickman, yardman in the employ of the Electrical Power Storage Co., Ltd., against F. W. Berk & Co., Ltd., manufacturing chemists, of Fenchurch Avenue, E.C., for damages for personal injuries suffered owing to the alleged negligence of the defendants or their servants. Mr. Lever was counsel for the plaintiff, and Mr. Craig Henderson represented the defendants.

Counsel for the plaintiff said his client was employed by the Electrical Power Storage Co. at Millwall. His duties were to look after the yard. On February 11th the defendants sent a load of 20 carboys of sulphuric acid. The carboys were extremely dangerous to handle, and in order to protect persons handling them the mouths of the carboys were sealed with an earthenware stopper and were fixed into the neck of the carboy with plaster of paris. Upon the arrival of the vanload of carboys, the plaintiff and another man went to assist in the unloading. The carboys weighed about 2 cwt. each. A sort of chute was used to unload the carboys from the tailboard of the van. When about half the carboys had been delivered, one was brought forward to the slightly sloping chute. This caused the acid in the carboy to splash up against the stopper, which, if it had been properly sealed in, would have prevented the liquid coming through. Some of the corrosive liquid in splashing against the stopper came through a hole between the stopper and the glass carboy, and splashed on to the plaintiff's face, nose, cheeks and chin. His burns were treated at Poplar Hospital, and from there he was sent to the London Hospital. The plaintiff was unable to continue his work for six weeks, and was during that time attending the Hospital as an out-patient. He had suffered a painful injury, and he now claimed compensation.

The Plaintiff, in his evidence, said that during the six weeks he was attending the hospital he had no wages. He had, however, received loans amounting to £3 10s., for which he gave I.O.U.'s. His standing wage before the accident was 28s. a week. On the day after the accident the wages of workpeople were increased.

Medical evidence having been given, it was stated for the defence that the liability of the defendants was completed when the carboy was put upon the tailboard of the van. As a matter of indulgence, the carman might give a little assistance by putting it on the top of the chute. When the carboys left the defendants' factory they were acid-tight, and had there been any fissure between the stopper and the neck of the carboy the liquid must have splashed on to the carman while he was trundling the carboy along the van to the tailboard. It was while getting the next carboy that the carman heard a shout as though someone was in pain. Upon the carman turning there was a carboy on the ground, and a piece of plaster of paris which was on the neck of the carboy had broken away. Evidence was called by the defendants to show that in loading and unloading carboys they were handled vertically, and whether containing concentrated acid or dilute acid the stoppering was the same. There was a custom of using a leaden cup over the carboy in order to save any accident in case anything went wrong with the stoppers.

The jury returned a verdict for the plaintiff, awarding him £34 12s. damages, and judgment was entered accordingly, with costs.

Trading with "Neutrals."—Since our leading pages went to press the Board of Trade has issued the following warning with regard to trading with the enemy :—

"The Board of Trade direct the particular attention of all manufacturers and traders concerned in the export trade to the need for scrupulous care in the transaction of their business abroad. The Government's reprisals policy, formally announced by the Order in Council of March 11th, 1915, is directed to suppress all enemy trade, whether import or export. The main difficulty in making this policy thoroughly effective arises from the fact that some traders in some neutral countries are making themselves agents for the supply of goods to enemy countries. British firms engaged in foreign trade, therefore, must have regard to these circumstances, and survey with great caution every opening for business which is offered them by neutral importers or exporters.

"Especial care should be taken in opening new accounts in neutral countries, and in relation to any orders or inquiries of an abnormal character. In any case of doubt as to the *bona fides* of particular consignees, business should be suspended pending reference to the Board of Trade. It is unadvisable that any new accounts should be opened by any British trader in neutral countries during the war without the fullest inquiries as to the character of the business proposed to him.

"The Board feel sure that they can rely upon the cordial co-operation of all firms engaged in foreign business to secure the successful working of the reprisals policy.

"It must be added that the proclamations relating to trading with the enemy cover indirect trading with the enemy through neutral agents, and that carelessness in transacting neutral business may involve traders in the severe penalties attaching to trading with the enemy."

It will be noticed that this warning relates mainly to the supply of goods to neutral firms; but the placing of large orders abroad, to which we drew attention, is of at least equal importance, for it may result in providing the enemy with funds.

Inquiries.—Makers of celluloid accumulator boxes and *papier mâché* covers for switches are asked for.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Electricity Committee of the Woolwich Borough Council has granted permission to MR. H. WOODWARD, general assistant, to enlist, and he has joined the Army Ordnance Corps. Owing to the nature of his work permission to enlist has been refused to MR. E. ANDERSON, assistant engineer at Plumstead Works.

The Barrow-in-Furness T.C. has, by 18 votes to 8, rejected a recommendation by the Electricity Committee that an honorarium of £100 should be granted to the electrical engineer (MR. BURNETT), in recognition of extra services rendered during the past two years. A member suggested that the honorarium was proposed because the Council had rejected a motion to increase Mr. Burnett's salary.

MR. S. CAMERON GIBSON, borough electrical engineer, Nuneaton, has accepted an appointment as Lieutenant Commander R.N.V.R., to take up special duties. MR. H. HODGES has been appointed acting electrical engineer during his absence.

The Walsall Electricity Committee proposes to increase the salary of MR. A. PRENTICE, the station superintendent, from £225 to £250 per annum, and that of MR. C. W. COOKSON, the accountant and collector, by £13 per annum.

With reference to the first item appearing in this section last week, we learn that the statement that MR. JEWELL, mains superintendent, had severed his connection with the undertaking of the Woking Electric Supply Co., Ltd., is incorrect.

Tramway Officials.—The staff of the Northampton Corporation tramways have presented MR. G. H. MARGRAVE, the chief clerk, who has left to take up another appointment, with a marble clock. The presentation was made by the general manager, Mr. J. F. Cameron.

General.—MR. SAMUEL CHARLES LAWS, B.Sc., M.A., Principal of the Loughborough Technical Institute, who has just been appointed to the principalship of the Wigan Mining and Technical College, entered St. John's College, Cambridge, in 1901, in order to carry on electrical research in the Cavendish Laboratory. For his work there he was awarded the Special Certificate for Distinguished Research and the University (M.A.) Degree. He contributed a number of papers embodying the results of original researches, most of which were connected with the modern electron theory of the conduction of electricity in metals.

MR. J. G. GRIFFIN, general manager of the Delhi Electric Tramways and Lighting Co., Ltd., is home on short leave. His address is Basildon House, Moorgate Street, E.C.

On the occasion of their silver wedding, MR. and MRS. F. H. TAYLOR, of Catford, S.E., have been presented by the directors of the General Electric Co.. Ltd., with which Mr. Taylor is associated, with a set of silver *entrée* dishes.

MR. JOHN M. M. MUNRO, of Glasgow, has also opened a consulting office at 11, Randolph Place, Edinburgh.

Obituary.—The death has occurred of MR. C. BONNETT, A.M.I.E.E., in hospital in Bombay, of smallpox, on May 8th. He has been in India over 13 years, most of the time in the employment of Messrs. Osler, and principally engaged on their Kabul work. He was a *persona grata* with the Amir, who keenly appreciated his good work there. Our Indian correspondent writes:—"Outside his engineering work in Bombay Mr. Bonnett was known as a charitable worker among the poor and needy, who will seriously feel his sad loss. He was an honest man, of sterling qualities, who leaves a blameless record behind and a good example for others to follow."

The death is announced of MR. FREDERICK LOWE, who had for the past 27 years been with Messrs. Page & Miles, Ltd., electrical engineers, of Brighton. He was 52 years of age.

The death from pneumonia is announced of MR. CHARLES EDWARD HOARE, of Rickmansworth, for many years electrician on the staff of the Metropolitan and Great Central Railway Co. He was in his forty-second year.

NEW COMPANIES REGISTERED.

Fuller's Wire and Cable Co., Ltd. (140,633).—This company was registered on June 11th, with a capital of £25,000 in £1 shares, to carry on the business of makers of telegraph, telephone and electric wires, cables and appliances, drawers, workers and weavers of wires, manufacturers of ropes, cords, twines, cables and hawsers, manufacturers and workers of indiarubber, rubber goods and fabrics, vulcanite, ebonite and similar commodities for medical, motor-car, sport, household and commercial purposes, mechanical and electrical engineers, etc. The subscribers (with one share each) are: G. Fuller, Elm Croft, Hulton, Essex, electrical engineer; G. J. A. Fuller, Badwell Cottage, Draycot Road, Wanstead, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are G. Fuller, G. J. A. Fuller, L. Fuller, and F. J. Gordon. Remuneration £100 each per annum (chairman £150). Secretary (*pro tem.*): G. J. A. Fuller. Registered office: Woodland Works, Wick Lane, Old Ford Road, Bow, E.

Buttevant Electric Co., Ltd. (4,252).—This company was registered in Dublin on June 11th, with a capital of £800 in £1 shares, to carry on at Buttevant and elsewhere the business of an electric light and power company. The subscribers are: C. G. Crofts, Velvetstown, Buttevant, Co. Cork, 240 shares; S. E. Crofts, Buttevant, Co. Cork, electrical engineer, 100 shares; S. Nolan, 2, Anglesea Terrace, Cork, electrical engineer, 230 shares; E. Nolan, Victoria Avenue, Old Blackrock Road, Cork, 230 shares. Private company. The number of directors is not to be less than three or more than five; the first are C. G. Crofts, S. E. Crofts, and S. Nolan. Qualification, £50. Registered office: Buttevant, Co. Cork.

H. Garstang, Ltd. (140,580).—This company was registered on June 7th, with a capital of £2,000 in £1 shares, to take over the business of an electrical and motor engineer carried on by H. Garstang at Mincing Lane and St. Peter Street, Blackburn. The subscribers (with 100 shares each) are: H. Garstang, Mincing Lane and St. Peter Street, Blackburn, electrical and motor engineer; Mrs. M. E. Garstang, Mincing Lane and St. Peter Street, Blackburn. Private company. The number of directors is not to be less than two or more than five; the first are H. Garstang and Mrs. M. E. Garstang (both permanent). Qualification 100 shares. Remuneration as fixed by the company. Solicitor: C. W. Eastwood, 13, Richmond Terrace, Blackburn. Secretary: H. Garstang. Registered office: Mincing Lane, Blackburn.

Barraclough Brothers, Ltd. (140,589).—This company was registered on June 8th, with a capital of £3,000 in £1 shares, to take over the business of electrical engineers recently carried on by Reside & Co., Ltd., at Perseverance Mills, Brighouse, Yorks., and elsewhere, to carry on the same and the business of mechanical and motor engineers, millwrights, tool makers, ironmongers and general merchants, etc., and to adopt an agreement with W. H. Sayers. The subscribers (with one share each) are: W. Barraclough, Eastcliffe, Lightcliffe, electrical engineer; F. Barraclough, Highfield Avenue, Bailiffe Bridge, electrical engineer. Private company. The first directors are W. Barraclough and F. Barraclough. Qualification, 100 shares. Solicitors: B. H. Richardson, 22, Briggate, Brighouse.

Free Wire Light Co., Ltd. (140,578).—This company was registered on June 7th, with a capital of £1,000 in £10 shares, to carry on the business of wiring houses of intending consumers of electric light with the necessary cables, wires, lamps, fittings and appliances, etc. The subscribers (with one share each) are: F. R. Reeves, Salisbury House, London Wall, E.C., accountant; J. N. A. Houblon, Artillery Mansions, S.W., engineer. Private company. The number of directors is not to be less than two or more than six; the first are F. R. Reeves, J. N. A. Houblon, and E. Reeves. Solicitor: S. H. Brown, 2 & 5, West Street, Finsbury Circus, E.C. Registered office: Salisbury House, London Wall, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Birkdale District Electric Supply Co., Ltd. (70,259).—Capital £50,000 in £5 shares. Return dated May 17th, 1915. 9,200 shares taken up; £5 per share called up on 6,000 and £3 per share on 3,200 shares; £39,600 paid. Mortgages and charges at date of return, £3,000; since issued (May 18th, 1915), £3,000 debs. ranking equally with first £3,000.

British Mica Co., Ltd. (72,187).—Capital, £5,000 in £1 shares (2,000 pref.). Return dated March 18th, 1915. 629 pref. and 2,000 ord. shares taken up, £1 per share called up on 629 pref.; £629 paid; £2,000 considered as paid on 2,000 ord. shares. Mortgages and charges: Nil.

Altrincham Electric Supply, Ltd.—Particulars of £50,000 debentures, created by resolutions of June 7th, 1898, April 18th and October 3rd, 1912, and May 31st, 1915, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £3,200. Property charged: The company's undertaking and property, present and future. No trustees.

Atlas Carbon and Battery, Co., Ltd. (34,857).—Capital, £2,000 in £1 shares. Return dated December 29th, 1914 (filed March 26th, 1915). All shares taken up; £8 paid; £1,992 considered as paid. Mortgages and charges: £3,000.

Bastian Meter Co., Ltd. (53,304).—Capital £20,235 10s., in 3,000 pref. shares of £1 each and 68,942 ord. shares of 5s. each. Return dated March 11th, 1915. 2,011 pref. and 39,672 ord. shares taken up; 5s. per share called up on 4,272 ord. and £1 per share on 2,011 pref.; £3,082 10s. paid, including £3 10s. paid on 14 shares forfeited; £8,850 considered as paid on 35,400 ord. shares. Mortgages and charges: £1,450.

Beck and Moss, Ltd. (69,298).—Capital, £2,500 in £1 shares. Return dated March 13th, 1915. All shares taken up; £1 per share called up on 525; £525 paid; £1,975 considered as paid on the remainder. Mortgages and charges: £250.

Navaltum, Ltd.—Particulars of £5,600 debentures, created March 22nd, 1915, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £5,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees. A memorandum of satisfaction in full on May 22nd, 1915, of debentures dated May 8th and July 3rd, 1914, securing £900, has also been notified.

Carville Site and Power Co., Ltd.—Issue on May 28th, 1915, of £10,000 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

Globe Telegraph and Trust Co., Ltd.

THE net revenue for the year ended May, 1915, after deduction of expenses, amounts to £209,165, and makes, with £25,724, brought forward, a total of £234,888. From this there has been distributed £129,122, in interim dividends, leaving £105,766. The directors now recommend final dividends of 3s. on the preference and 6s. on the ordinary, bringing up the total distributions in both cases to 6 per cent. per annum. There then remains £27,655 to be carried forward.

During the year £11,200 Anglo-American Telegraph Company's preferred stock has been sold, and the proceeds have been re-invested in shares of the Great Northern Telegraph Co. and Direct Spanish Telegraph Co. Seventeen certificates of the Submarine Cables Trust, belonging to this company, have been drawn and paid off at £120 per certificate, producing £2,040; most of this has already been re-invested, and the remainder will be placed in suitable securities.

German-Netherlands Telegraph Co.

THE report for 1914 of the Deutsch-Niederlandische Telegraphen Gesellschaft, of Cologne, states that the cable station at Yap was placed under the Imperial District Board on August 1st, and the working of the Menado station was taken over by the Netherlands Indian Government two days later, the company's Dutch officials continuing the cable service. On October 7th the island of Yap was occupied by the Japanese, and from that time the company's cable service had to be entirely suspended. The cables, as shown by recent tests, are in good condition. The officials were first conveyed to Nagasaki by the Japanese, but were released after a few days; the German officials are now at Shanghai, whilst the oldest Dutch telegraphist was permitted by the Japanese to remain with a German superior official at Yap to look after the company's property. The accounts show gross receipts amounting to £102,900, as compared with £103,200 in 1913, interest and balance forward increasing the sums to £108,100 and £108,500 in the two years respectively. After meeting general expenses, the amount of £8,750 has been placed to the cable renewal fund, as in 1913, and £14,000 to the cable maintenance and repairing funds, as against £14,800, leaving net profits of £41,600, as compared with £40,300 in the previous year. A dividend at the rate of 6½ per cent. has been declared on the ordinary share capital of £350,000, being the same as in 1913, and £11,900 has been carried forward. The report adds that the agreement with the Great Northern Telegraph Co., of Copenhagen, for the repair of the company's cables in cases of interruption has been prolonged for a further period of 10 years, as from June 1st, 1915, although the annual payment for the service has been reduced by £3,000.

A Swiss Investment Undertaking.

The Motor, A.G. fur Angewandte Electricitat, of Baden, Switzerland, which is chiefly a holding company belonging to the Brown-Boveri group, reports that the influence of the war on the electrical distribution of power varied according to the geographical situation of the undertakings. On the outbreak of hostilities a large reduction in the consumption of power suddenly took place in general, although a renewed demand soon arose, even in the case of works whose area of supply lies within the war area. The most important event of the year was the disposal of the shares held in the Beznau-Lontsch power works to the North-East Swiss power works, in which nine Swiss cantons are interested. Thus there had passed from the company's possession highly remunerative shares in an undertaking which the company had brought to a great level of development in the course of many years, but the directors had been unwilling to adopt a negative attitude towards the proposals put forward by the cantons. On the other hand, the company acquired 40 per cent. of the shares in the Gustav lignite mines at Dettingen-on-the-Main, in order to provide fuel in connection with a comprehensive extension of the works of the Electric Power Supply Co., of Mannheim, which is financially interested in the local Brown-Boveri Co. After meeting the interest charges on the loan capital of £1,827,000, and apportioning £5,200 to depreciation as against £3,400 in 1913, the accounts of the Motor Co. indicate net profits and balance forward totalling £125,000, as contrasted with £115,000 in the previous year. It has been decided to pay a dividend of 7 per cent. on the ordinary share capital of £1,500,000, being the same rate as in each of the two preceding years, leaving £2,800 to be carried forward, as against £1,500 in 1913.

Italian Electrical Companies.

The Societa Italiana per la Fabbricazione dell' Alluminio, of Rome, in which a group at Rome is interested as well as German capital, reports gross profits of £17,500 in 1914. The sum of £12,000 has been applied to depreciation, and £4,000 placed to the reserve fund, the balance being carried forward. As a consequence no dividend is payable on the share capital, which was reduced in 1911 from £120,000 to £48,000.

The Elettricita Alta Italia, of Turin, with which the Swiss Electrical Industry Co. is associated, reports that the transmission line between Montjovet and Bollenzo was brought into operation in 1914, thus enabling the company to derive full advantage from the hydro-electric works in the Aosta Valley. The net profits, after allocating £38,000 to depreciation, as compared with £36,000 in 1913, amount to £62,000, as against £62,200, thus enabling the payment of a dividend of 5½ per cent. on the ordinary capital of £1,000,000 as in the previous year.

The Officini Elettriche Genovesi, which is connected with the Zurich Bank for Electrical Undertakings, and affords a supply in Genoa and neighbouring districts, reports gross profits of £159,000 for 1914. After defraying interest on loan capital amounting to £794,000, and setting aside £40,000 for depreciation, the net profits and balance forward are returned at £89,600, as against £89,200 in 1913. It is intended to distribute 10 per cent. on the ordinary share capital of £800,000, being the same rate as in the preceding year.

The report of the *Unione Italiana Tramways Elettrici, of Genoa*, which is closely associated with the Zurich Bank for Electrical Undertakings, states that the conditions of the new contract with the municipal council came into full operation in 1914 for the first time. After devoting £32,800 to depreciation, as compared with £30,000 in 1913, the accounts show net profits of £70,400, as against £76,000 in the previous year. It is proposed to pay a dividend of 8¼ per cent. on the share capital of £720,000, as contrasted with 9¼ per cent. in 1913, to place £3,300 to the reserve fund, and to carry forward the balance.

German Electrical Companies.

The Concordia, Elektrizitats Gesellschaft, of Dusseldorf, earned gross profits of £24,800 in 1914, as contrasted with £24,000 in the preceding year, and net profits of £12,300, as against £10,000. It is intended to pay a dividend of 10 per cent., as compared with 20 per cent. in 1913, to place £4,000 to a war reserve fund, and to carry forward £2,800.

The Treuhand Bank fur die Elektrische Industrie, of Berlin, which now belongs to the A.E.G.—Carlswerk group, participated, in 1914 for the first time, as a financing institution, for which purpose it was originally constructed in 1909 by the Felten & Guilleaume Co. (Carlswerk). The amount in question is £575,000, the transactions necessitating a further call on the unpaid share capital. As net profits, the accounts record the sum of £21,900, as compared with £14,200, and the dividend is 4 per cent. on the paid capital of £500,000, as contrasted with the same rate on £312,000 in the previous year.

The report of *Meirowsky & Co., of Porz, Cologne*, whose manufactures comprise insulation materials, condensers, etc., records a satisfactory course of business down to the outbreak of the war, when the turnover considerably declined, partly owing to many vetos imposed on exports even to neutral countries. As a consequence of the particular classes of manufactures made, it was impossible to obtain compensation through the production of war material. The gross profits decreased from £63,000 in 1913 to £40,000 last year, and the net profits from £29,000 to £23,000, the dividend on the share capital of £150,000 also falling from 12 per cent. to 9 per cent. in the two years respectively.

The directors of the *Bergmann Elektrizitats Werke, of Berlin*, whose financial results were recorded on May 21st, report that the slackening in the general economic situation, which was in progress in 1914, did not materially prejudice the company's activity until August, when stagnation in the export trade and restrictions in working on peace manufactures took place. But in the final two months of the year, after overcoming the difficulties associated with the adoption of every new method of manufacture, an increased efficiency was reached in the departments which were organised for war work, and the number of workers, despite the calling of 1,645 to the colours, was brought at the end of 1914 to the level which prevailed at the close of July. At the general meeting, held on May 29th, it was announced that the orders on hand would provide work for months forward, and that work was being carried on day and night and on Sundays.

The report of *Hartmann und Braun, of Frankfort-on-Main*, states that the earning conditions were greatly influenced by the war, as a considerable portion of the company's manufactures were for export, and hostile countries were mostly concerned in this respect. Although the mechanical workshops were not essentially equipped with the larger machine tools necessary for the manufacture of war material, it was possible for the company, after some time of diminished activity, to return to normal conditions and even to increased working to some extent. The accounts indicate gross profits of £88,000, as against £100,000 in 1913. After defraying general expenses, interest on loans for £103,000, and setting aside £12,000 for depreciation as compared with £11,000, the net profits and balance forward are returned at £15,000, as against £27,800 in 1913, and a dividend of 8 per cent. has been declared on the share capital of £85,000, as contrasted with 10 per cent. in each of the four preceding years.

Rangoon Electric Tramway and Supply Co., Ltd.

THE directors report that during 1914 the cars travelled 1,482,478 miles, a decrease of 17,282, and carried 11,138,948 passengers, a decrease of 288,608. The total receipts were Rs. 8.82,917, a decrease of Rs. 49,035, or 5.2 per cent. Up to the outbreak of war the monthly receipts showed a gain of Rs. 19,282 and under normal conditions the rate of increase would have been continued. Confidence among the Burmese and the natives of India is gradually being restored, and an improvement in the traffic is now observable. Motor omnibus traffic (593,722 passengers) has been maintained, the gross receipts being Rs. 39,702, and the expenses Rs. 42,814. This department is in its infancy, and a slight loss is not

surprising. The 'buses are expected to act as a valuable feeder to the tramways. The gross receipts for current supplied for private lighting and power were Rs. 6.43,539, an increase of 11.52 per cent. The working expenses were 43.14 per cent. of the receipts, as against 42.16 per cent. in 1913. The gross receipts of the house wiring and supply department were Rs. 1.52,699, and the profit was Rs. 25,343, as compared with Rs. 22,478 in 1913. The gross profits were £62,453 plus £1,168 for transfer fees and interest. This is disposed of as follows:—Interest on debenture stock (£13,119); 4½ per cent. debenture stock redemption provision, £6,100; depreciation on sundry assets in Rangoon, £1,767; reserve for renewals, £12,500; special reserve for cables, etc., £2,000; and other items making £41,600, leaving a net profit of £22,021 plus £1,055 brought forward. After paying preference dividend £15,000 and 3 per cent. on the ordinary shares, £2,766 is to be carried forward. An alteration of the articles is proposed extending the period for the presentation of the accounts. A provident fund of which all employés under written agreements will be compelled to become members has been established. The subscription is 5 per cent. of salary, the company contributing £500 each year in which a dividend is paid on the ordinary shares. Messrs. S. Balthazar, F. Tobin and J. Taylor have resigned their seats on the board. Mr. J. Glynn, of Liverpool, has been elected a director, and Col. A. C. de L. Joly de Lotbinière and Mr. H. D. Dickie are recommended as directors. Sir F. W. R. Fryer, K.C.S.I., formerly Lieut.-Governor of Burma has accepted the chairmanship rendered vacant by the resignation of Mr. Tobin.

Annual meeting, June 23rd.

New General Traction Co., Ltd.

The annual meeting was held on Tuesday at the offices, 8, Crosby Square, E.C. Baron Emile B. d'Erlanger, who presided, said it was a rare pleasure in these days to be able to preside over the meeting of a joint-stock company and to be able to say that the results had been but little affected by the war. Fortunately, that was so in their case, and after paying the same dividend as last year, viz., 4 per cent., they were able to carry forward £7,081, against £6,500 brought into the account. The war had adversely affected the Douglas Southern Electric Tramways, Ltd., in which they held a certain interest. That company had experienced a large falling off in revenue, and had only paid a dividend of 1½ per cent. last year; and he was afraid they could not look forward to any dividend for the current year. Fortunately, their holding in that company was only a small one, and, although they might be deprived of any revenue next year from that source, it would only affect them slightly. As regarded the Norwich Tramways, the receipts had been practically unaffected by the war, although the services had been curtailed through the early closing hours. Last year they obtained a valuable franchise for the extension of the tramways in Norwich, but owing to the difficulty in obtaining labour consequent upon the war the work had been suspended by agreement with the Corporation, and it was impossible to say when it would be resumed.

Mr. C. Pakeman seconded the motion, which was carried unanimously.

British Electric Traction Co., Ltd.

The report for the year ended March 31st, 1915, states that the progress of the associated companies in regard to tramway and omnibus traffic, and the sale of electricity, continued to be satisfactory up to the declaration of war. The disturbance in the business which then took place adversely affected the receipts of most of the undertakings, especially those which relied upon holiday traffics. On the other hand, the receipts of certain undertakings have increased during the war owing to exceptional activities in the districts in which they operate, and during the last few months many of the other undertakings have shown some recovery. Having regard to the general conditions which prevailed during the greater part of the year, the board have not undertaken new enterprises involving commitments of any magnitude. The existing businesses of the associated companies, however, have been fully maintained and consolidated, and in some cases extended. Negotiations for the improvement in the tenure of certain of the associated companies are in progress. An agreement has been entered into for the sale of the tramway undertaking of the Devonport and District Tramways Co. to the Plymouth Corporation at a price to be settled by arbitration, and is now before Parliament for confirmation. The gross profit amounts to £235,508, as compared with £225,754 for 1913-1914. After deducting the general expenses there remains £209,295, plus £17,130 brought forward. Deducting debenture stock interest (£91,367) there remains £135,057. The revenue account has been debited with £11,191 for additional reserves against sundry assets. The directors recommend the payment of the dividend for the year upon the 6 per cent. cumulative preference stock, and a dividend of 3½ per cent. upon the 7 per cent. non-cumulative preference stock, together amounting to £52,467, being dividends at the same rate as those paid for the preceding year. This leaves a balance of £71,399, and in view of the directors' proposal to proceed with the reduction and re-arrangement of capital, it is not proposed to place any portion of this amount to reserve for depreciation, but to carry the whole amount forward. During the year investments of the book value of £59,379 have been sold at a net loss of £117. The revenue from the investments and undertakings amounted to £217,184, as compared with £209,045 in the previous year. The yield for the past year on £4,771,842 was 4.55 per cent., as compared with 4.47 per cent. for the preceding year on £4,672,458. The reserve against depreciation of investments is now £482,162, which is deducted from the amount at which the investments and undertakings stand in the books. There are additional reserves of £61,666 against other assets, and a balance of unallocated revenue amounting to £71,399, which it is proposed to carry forward. The directors are of opinion that, subject to some small modifications, the scheme for reduction and re-arrangement of capital should now be proceeded with, and they propose to call the necessary meetings at an early date. Mr. J. S. Raworth, who has been a director since the formation of the company, has resigned his seat at the board, but his services have been retained by the company as technical adviser. Mr. Alfred Shepherd has been appointed to fill the vacancy.

Annual meeting: June 25th.

Aluminium Corporation, Ltd.

In their report for 1914 the directors state that notwithstanding that the rainfall during the year was not sufficient to enable the works to be carried on at their full capacity during the whole period, together with the adverse conditions created by the war, they record a further increase in gross profits. After providing for debenture interests and other charges, the net profits amount to £7,812, plus £120 brought forward. There is to be applied in writing off depreciation on plant and machinery £3,394, and on buildings account £1,252, leaving £3,286 to carry forward. The contractor having failed to fulfil his contract for the construction of the tunnel to bring the Dulyn water into the Eigiau Lake, the completion of the tunnel has been seriously delayed, but the company has now undertaken the work and satisfactory progress is being made. With a view to providing the necessary capital to extend the company's water power, etc., the directors have considered it expedient to increase the first mortgage debenture stock from £50,000 to £150,000. The chairman of the company (Mr. K. M. Clark) has taken up the increased stock to the extent of £15,000 in satisfaction of his loans to the company, and since the close of the accounts, has also agreed to take up an additional £10,000 of the increased stock in lieu of his second debentures, which became redeemable in April last. It is proposed to offer the balance of the increased debenture stock to the shareholders *pro rata* to their holdings. In accordance with resolutions passed, the rights relative to the participating shares have been revised.

Annual meeting: June 17th.

United Electric Tramways of Monte Video, Ltd.

The annual meeting was held on Monday at Winchester House, E.C., Mr. G. A. Touche, M.P., presiding. The Chairman said he had not a very cheerful story to give, as Uruguay, in common with all South American States, had been passing through a period of adversity. The situation had been one of much difficulty. The commercial depression which made the previous year's operations unsatisfactory was continued and aggravated during the year under review. It could not be attributed to the war, although that accentuated the difficulties. Its origin lay in other causes, partly economic and partly climatic. To meet their financial engagements the Government had found it necessary to create internal debts bearing high interest. Bad times financially were bound to operate unfavourably on their traffics. But misfortune did not come alone, and the elements also conspired to make things unpleasant. Continuous bad weather prevailed, and the country was visited by several violent cyclones, which not only paralysed traffic for hours—in some cases days—but involved expense for repairs to the company's property. The board had also had many anxious questions to deal with from the expense point of view. The traffic receipts for the year were £361,465, a decline of £12,061, or 3.23 per cent. The last three months of the year—the period covered by the war—were accountable for more than two-thirds of the total decrease. The number of passengers carried decreased by 759,841 to 43,862,849. Operating expenses were 60.86 per cent. of the gross receipts, an increase of 1.28 per cent. This was an actual decrease in the amount of expenses of £2,553, but it would have required a further decrease of £4,626 to maintain the same ratio of expenses to receipts. That was impossible of achievement. The year had to bear exceptional expenditure resulting from the storms and cyclones, and the resulting floods, amounting to £3,164. There was an unavoidable additional loss of £745 in the discounting of nickel and silver currency, and an increase in maintenance charges of cars and permanent way of £1,135. Those items, totalling £5,044, represented more than the further decrease of £4,626 required to maintain a steady ratio of working expenses. Every care was taken to counteract the decrease in receipts, and important economies were effected. The principal of these economies was in the consumption of

electric current. To accomplish this purpose a very strict system of instruction and supervision of the drivers had been instituted. The net traffic receipts for the year were £141,477, a decrease of £9,508, or 6.30 per cent. The total credits to profit and loss account amounted to £135,858, a decrease of £11,826. The profit and loss account charges amounted to £58,823, an increase of £2,420. This was more than accounted for by the increases of debenture stock interest, viz., £1,920, and income tax £2,440. The net profit for the year was £77,035, plus £12,641 brought forward, making a total of £89,676. This was proposed to be dealt with as follows:—£3,370 had been set aside for redemption of debenture stock, and £2,500 towards redemption of the share capital; £25,000 had been added to the renewals and contingency account, making the total set aside for that purpose to date £155,000, out of which a sum of £15,832 had been written off, leaving a balance of £139,168. For four consecutive years they had paid 7 per cent. on the ordinary shares, so that a reduction to 4 per cent. was disappointing, but not surprising to those who knew the severity of the crisis through which South America was passing. The capital expenditure for the year totalled £50,610, compared with £122,158 in the previous year. In view of the big fall in revenue and the serious outlook, all expenditure of a capital nature had, as far as possible, been rigorously curtailed. The completion of the two sub-station buildings and the installation of the necessary plant practically accounted for the whole of the expenditure during the year. A considerable sum (about £20,000) would be required for additional rolling stock on order, but not delivered. A further issue of capital would be required in the future (when the British Treasury rules permitted), for the company must look to some continuing expenditure, governed, in part, by the development of the city, and in part by the programme of the municipality, especially as regards paving. Coming to the results for the first six months of the current year, frankness compelled him to tell them that the position was worse. None of the adverse conditions had yet disappeared; financial depression continued; weather conditions throughout the summer season had been bad, four months of the six being classed as rainy, and the remaining two as unsettled. Expenses were increasing, in some directions in an unprecedented degree. The price of coal had risen, and freight had doubled, so that their coal bill—always a heavy item, would this year be exceptionally large. The actual figures for the half-year were: Traffic receipts—1915, £174,655; 1914, £200,181, a decrease of £25,526; net receipts—1915, £68,311; 1914, £88,095, a decrease of £19,784. It was difficult to foresee what would transpire during the second half of the year now current. The worst might be nearly over, for they would soon arrive at a time when the takings would begin to compare with the months of last year that showed the heavy decreases. They were clearly in for a bad year. The tide was still on the ebb, but it might turn before long, and when it did the flow, if not so rapid as the ebb, might be very pronounced. There were several factors making for a return of prosperity. There was the practice of individual thrift, while war conditions had established a steady market at favourable prices for pastoral and saladero produce, such as cattle and sheep, wheat and maize. With diminished expenditure and imports and better prices for exports, gold would flow into the country. Already the improvement in South America was beginning to manifest itself in portions of the Argentine. In some respects Uruguay was a little later than Argentina in feeling the full force of the decline, and she might be later also in experiencing the full benefit of the recovery.

Mr. H. F. Gunning seconded the motion.

Replying to a shareholder, the Chairman said they had been experimenting with oil fuel, and were still doing so, but the trouble was the question of supply at advantageous prices.

The report was adopted.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.—As foreshadowed in the chairman's remarks at the half-yearly meeting in June last, it has been decided to abandon the half-yearly meeting, a course pursued by many other companies during the war. In announcing this fact the directors report that the works at Silvertown are very busy in many departments, and it is hoped that the year's results will be favourable, though the prices of labour and coal are considerably higher than last year owing to the war. The cable-ship *Dacia* has had considerable employment, and the board has reason to expect a continuance of it. The French works were closed entirely for several weeks during last year on account of the close proximity of the German Army. As stated in the directors' report for last year, before the war broke out the organisation had been placed on a thoroughly sound basis, and the works, although greatly hampered by the shortage of labour, are now doing a sound and steady business. The directors have decided to distribute a dividend of 5s. per share, less income-tax, on the preference shares, being the half-yearly dividend due on July 1st, at the rate of 5 per cent. per annum; and a dividend of 5s. per share, free of income-tax, on the ordinary shares, being an interim dividend of 2½ per cent.

Shawinigan Water and Power Co.—A dividend of 1½ per cent. on the common stock for the quarter ending June 30th is announced.

Montreal Light, Heat and Power Co.—The report for 1914 states that the net revenue was 3,085,907 dols. which, after deducting fixed charges (489,164 dols.), leaves the net income 2,596,743 dols. Dividends to the amount of 1,827,500 dols. have already been paid and 10,000 dols. have been appropriated to the officers' and employés' pension fund, leaving 759,243 dols. to be transferred to general surplus. The increases in surplus earnings have accrued mostly from the operations of the earlier part of the year, and while the effects of the disturbed business conditions resulting from the war have not been so serious as for most industries, the effects of the depression have been distinctly felt in the unusually large number of disconnections and the increase in bad debts, the latter of which amounted to more than three times that of any previous year. The outlook for the coming year is not as bright as usual, and is aggravated by the fact that large expenditures for wax taxes on imported raw materials and supplies have to be faced. —*Financier*.

New British Ever-Ready Co., Ltd.—At the annual meeting held at the works, Hercules Place, Holloway, N., on June 7th, the directors reported that for the year ended March 31st, 1915, the profit available for distribution, including £859 brought forward, and after writing off depreciation, balance of preliminary expenses, &c., and transferring £5,000 to general reserve, amounted to £29,958. An interim dividend was declared and paid on the preference shares on December 1st, 1914, amounting to £2,975. The directors now recommended a final dividend on the preference shares at the rate of 6½ per cent. per annum, making the maximum of 10 per cent. for the year, requiring £5,525, and after payment of 10 per cent., and a bonus of 2 per cent. on the ordinary shares for the year, £7,658 is carried forward.

James Keith & Blackman Co., Ltd.—According to the *Financial Times* the net profit for the past year was £13,302. A dividend of 10 per cent., tax free, on the ordinary shares is to be paid.

Automatic Telephone Manufacturing Co., Ltd.—The share and transfer books will be closed from 17th to 24th inst. inclusive, for the purpose of preparing the dividend warrants on the 6 per cent. preference shares for the half-year.

National Electric Supply Co., Ltd.—Interim dividend 2s. 6d. per share, less income-tax, on the ordinary shares for the half-year.

Vulcan Boiler and General Insurance Co., Ltd.—An interim dividend at the rate of 18 per cent. per annum is announced for the half-year.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets are awaiting news with reference to the next War Loan. That some sort of issue is contemplated in the near future, the House regards as assured; and the debate in the House of Commons to-night (Tuesday), on the Vote of Credit, is expected to produce some sort of hint as to the Government's intentions. Money is plentiful enough, and there is still a demand for good-class stocks paying reasonable rates of interest. Something of a feature is the revival in the rubber share market, in consequence of the steady climb in the price of the raw stuff. Another feature this week has been sharp recovery in Underground Electric income bonds. The stocks and shares connected with the Electricity Supply companies are exceedingly quiet.

The income bonds of the Underground Electric Railways have recovered 5 of the 6½ points which they shed last week, and the price moved up to 75 as abruptly as it had dropped from that figure to 70. Pressure to sell has been removed, and a few buyers who came in with timid orders, in amounts of one and two hundreds, found that their intended operations had a remarkable effect. A good deal of business is doing in the bonds, and the contention advanced here last week that the fall was considerably overdone, while it was good at the time of writing, turned out to be too late to advantage readers, inasmuch as the recovery had started before this paper was published on Friday morning last. There is a small improvement to record in the Company's 1s. shares, but the £10 issue remains at 25s.

Districts had a sharp drop to 14¼, and so far have failed to recover. Metropolitans eased off to 28⅜, and Steam stocks are weak throughout, mainly on account of the fear that coal contracts, which have to be revised at the end of this month, will be effected at prices very different from those ruling previously. An advance of about 6s. per ton is expected to be, roughly speaking, the average addition to the companies' fuel bills.

This question of fuel affects, of course, illumination companies as well as the railways, and prices in the gas market are heavy. Amongst electricity shares, no changes have occurred since our last notes appeared; and the buyers who recently have been on the look out for cheap stock are still occupying the same position. It is said that most undertakings connected with the supply both of gas and electricity are being asked to adapt part of their machinery for the purposes of munitions, and it may be that this side-branch will be of useful assistance to the companies during the slackest period of the year. Business is quiet.

The British Electric Traction Co. repeats its previous dividend performance by declaring 3½ per cent. on the 7 per cent. non-cumulative preference stock, and this has caused a demand for all six of the Company's stocks. Prices are nominal, in the sense that there is scarcely any supply to be obtained, holders preferring to keep their investments, and, if anything, wishing to increase rather than to realise them. Therefore the 6 per cent. cumulative preference is up to 70, the 7 per cent. non-cumulative has risen to 35, the preferred and deferred to 10 and 5 respectively. B.E.T. 5 per cent. debenture stock is 87, and the 4½ per cent. second debenture stock, which has not changed hands for over six weeks, is called 75. For 1914, as already observed, the Company paid 3½ per cent. on the 7 per cent. non-cumulative preference stock, which was an improvement of ½ per cent. on the distribution for the previous twelvemonth.

The Victoria Falls and Transvaal Power Company has declared a dividend at the rate of 6 per cent. per annum for ten months on the preference shares, so clearing off all the arrears up to the end of April, 1914. This is a better result than had been expected, and the price of the shares improved to 15s. 6d., while the 5½ per cent. second mortgage debentures are a little better at 88½. The latter price, by the way, is 5½ points above the quotation of the debentures when war broke out; and the preference shares now stand about a florin higher than they did at that time.

Brazil Tractions are a jumpy market, and from 54, on Friday, they fell to 51½ to-day (Tuesday), the price moving in sympathy with the Rio rate of exchange. This touched nearly 1s. 1d. before it reacted a little. Mexican Industrials show a slightly hardening tendency, on the publication of the United States Note to Germany; this has been read as an indication that America has no intention of embroiling herself in the European struggle, and therefore may have the greater inclination to intervene in the cause of straightening out affairs in Mexico.

Anglo-Argentine Trams have improved a little as regards the 1st preference and the 4 per cent. debenture stock, though the Fives are ½ lower. A reassuring statement from the Central Argentine Railway says that the exodus of Italians from the Republic is not considerable, and it is hoped that, even if it increases, prejudicial influence will not be exercised thereby. Upon this, most securities connected with Argentina have braced up.

In the Telegraph market, Westerns gave way ¼ to 13½, notwithstanding the declaration of the third quarterly interim dividend of 3s. per share, as usual. Anglo-American Telegraphs are better, thanks to a marked improvement which has occurred in most issues connected with the United States. The Eastern group is a little dull. Good business is taking place in Marconis, for which optimistic dividend anticipations continue to act as the principal stimulus. Oriental Telephones gained the fraction at 2½, while, on the other hand, United River Plate Telephones eased off to 6 on the appearance of a small seller.

Callender's Cable shares have come in, on account, it is said, of a deceased estate; the price weakened ¼ to 11⅝, at which it will be noticed that the yield is the excellent one of six guineas per cent. Henley's have hardened to 14½, which makes the return on their shares £7 18s. 8d. per cent.; so that the previous difference of 42s. in the return is being diminished. General Electric preference gave way to 10. Liverpool is buying British Aluminium ordinary and preference; and although the nominal prices show comparatively little change, the market is a strong one, and there is not much floating supply. British Insulateds are firm at 11¼, and India Rubber shares at 9, while Babcock & Wilcox continue to change hands on the basis of 50s.

In the rubber market, as already indicated, there is noticeable strength and an unusual amount of animation. The price of the raw article is now close to half-a-crown per lb., and company after company shows that it can make highly satisfactory profits at anything like this figure. Attention for the time being is directed principally to the younger companies with large estates at present not wholly in bearing, the argument being that as their prices stand relatively and substantially lower than those of the more mature undertakings, there is considerably more scope for advance in dividends and capital value than the seniors can expect. The buying movement proceeds from the provincial centres as well as from London itself; and so long as the price of rubber keeps good, it is safe to prophesy that the share market will remain robust. Armament shares are quiet, unaffected in any way by the fiery eloquence of the Minister of Munitions. From the purely market point of view, his demand for more shells, and ever more shells, is countered by the knowledge that war profits are not going to be permitted to assume extravagant proportions.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend, 1914.	Price June 15, 1915.	Rise or fall this week.	Yield p.c.
HOME ELECTRICITY COMPANIES.				
Brompton Ordinary	10	8½	—	£6 1 8
do. 7 per cent. Pref.	7	7⅞	—	4 10 4
Charing Cross Ordinary	5	4½	—	5 17 8
do. do. 4½ Pref.	4½	4⅝	—	5 9 1
do. do. City Pref.	4½	4	—	5 12 6
do. 4 Deb.	4	90	—	4 9 0
Chelsea	5	4⅝	—	5 8 1
do. 4½ Deb.	4½	99	—	4 17 10
City of London	9	13⅜	—	6 11 0
do. do. 6 per cent. Pref.	6	12¼	—	4 18 0
do. do. 5 Deb.	5	11⅛	—	4 9 3
do. do. 4½ Deb.	4½	96	—	4 13 10
County of London	7	11⅜	—	6 3 1
do. do. 6 per cent. Pref.	6	11½	—	5 4 4
do. do. 1st Deb.	4½	100	—	4 10 0
do. do. 2nd Deb.	4½	95 xd	—	4 14 9
Kensington Ordinary	9	7	—	6 8 7
London Electric	4	1½	—	8 0 0
do. do. 6 per cent. Pref.	6	5	—	6 0 0
do. do. 4 Deb.	4	87	—	4 12 0
Metropolitan	8½	8⅛	—	5 12 5
do. 4½ per cent. Pref.	4½	4	—	5 12 6
do. 4½ Deb.	4½	94	—	4 15 9
do. 3½ Deb.	3½	74	—	4 12 0
St. James' and Pall Mall	10	7½	—	6 13 4
do. do. do. 7 per cent. Pref.	7	6⅝	—	5 9 10
do. do. do. 3½ Deb.	3½	75	—	4 13 4
South London	6	3	—	6 13 4
South Metropolitan Pref.	7	1½	—	6 4 5
Westminster Ordinary	9	7½	—	6 4 2
do. 4½ Pref.	4½	4¾	—	4 14 9
TELEGRAPHS AND TELEPHONES.				
Anglo-Am. Tel. Pref.	6	106	+1	5 13 4
do. Def.	1½	22⅜	+ ⅛	6 12 4
Chile Telephone	8	6⅝	—	5 18 5
Cuba Sub. Ord.	5	8½	—	5 17 8
do. Pref.	10	15	—	6 13 4
Eastern Extension	7	13	—	*6 3 1
do. 4 Deb.	4	91	—	4 8 0
Eastern Tel. Ord.	7	131½	— ½	*6 1 8
do. 8% Pref.	8½	76	—	4 12 1
do. 4 Deb.	4	91	—	4 8 0
Globe Tel. and T. Ord.	6	11	—	*6 4 9
do. Pref.	6	11¾	—	5 2 2
Gt. Northern Tel.	22	33	—	6 13 4
Indo-European	65/-	54	—	6 0 4
Marconi	20	1⅞	+ 3/32	10 13 4
New York Tel. 4½	4½	97	—	4 13 0
Oriental Telephone Ord.	10	2⅛	+ ⅛	4 14 1
do. Pref.	6	1 7/16	—	5 1 1
Tel. Egypt Deb.	4½	88	—	5 2 8
United R. Plate Tel.	8	6	— ⅛	*7 10 0
do. Pref.	5	5	—	5 0 0
West India and Pan.	1	1¼	—	8 0 0
Western Telegraph	7	13⅜	— ¼	*5 19 8
do. 4 Deb.	4	91	—	4 6 6
HOME RAILS.				
Central London, Ord. Assented	4	77	—	5 4 0
Metropolitan	1½	28⅜	— ¼	4 7 0
do. District	Nil	14⅛	—1⅛	Nil
Underground Electric Ordinary	Nil	1¼	—	Nil
do. do. "A"	Nil	4 6	+6d.	Nil
do. do. Income	6	75	+5	*9 6 8
FOREIGN TRAMS, &c.				
Anglo-Arg. Trams, First Pref.	5½	4⅛	+ ⅛	6 2 3
do. 2nd Pref.	5½	8⅜	—	7 6 8
do. 4 Deb.	4	84⅜	+ ½	4 14 6
do. 4½ Deb.	4½	87	—	5 3 6
do. 5 Deb.	5	86½	— ½	5 15 7
Brazil Tractions	6	51⅛	—2	11 13 0
Bombay Electric Pref.	6	10⅝	—	5 16 10
do. 4½ Deb.	4½	92	+1	4 17 10
Mexico Trams	Nil	33	+1	Nil
do. 5 per cent. Bonds	—	58	—	Nil
do. 6 per cent. Bonds	—	30	—	Nil
Mexican Light Common	Nil	20	—	Nil
do. Pref.	Nil	39	—	Nil
do. 1st Bonds	—	48	—	—
Adelaide Sup. 6 per cent. Pref.	6	5 5/8	—	5 13 0
do. 5 Deb.	5	103	—	4 17 1
MANUFACTURING COMPANIES.				
Babcock & Wilcox	14	2½	—	5 12 0
British Aluminium Ord.	5	21/9	+3d.	4 12 0
do. Pref.	6	18/6	—	6 9 9
British Insulated Ord.	15	11¼	—	6 13 4
do. Pref.	6	6⅝	—	5 0 0
British Westinghouse Pref.	7½	1⅞	—	8 0 0
do. 4 Deb.	4	72	—	5 11 1
do. 6 p. lien	6	101	—	5 19 0
Callenders	15	11⅞	— 4	6 6 4
do. 5 Pref.	5	5	—	5 0 0
do. 4½ Deb.	4½	98	—	4 12 4
Castner-Kellner	15	8½	—	4 12 6
Edison & Swan, £3 pd.	Nil	12/6	—	Nil
do. do. fully paid	Nil	1⅞	—	Nil
do. do. 4 Deb.	4	63	—	6 7 0
do. do. 5% Deb.	5	60	—	8 6 8
Electric Construction	6	13/-xd	—	9 4 8
do. do. Pref.	7	1xd	—	7 0 0
Gen. Elec. Pref.	6	10	— 3/8	6 0 0
Henley	20	14½	+ ¼	*7 18 8
do. 4½ Pref.	4½	4⅝	—	4 12 4
do. 4½ Deb.	4½	97	—	4 14 9
India-Rubber	5	9	—	5 11 1
Telegraph Con.	20	37	—	6 9 10

* Allowance made for dividends being paid free of income-tax.

Victoria Falls and Transvaal Power Co., Ltd.—The directors have declared a 10 months' dividend at the rate of 6 per cent. per annum, less income-tax, on the preference shares, thereby making the cumulative dividend paid up to April 30th, 1914.

ELECTRICITY IN FARMING.—III.

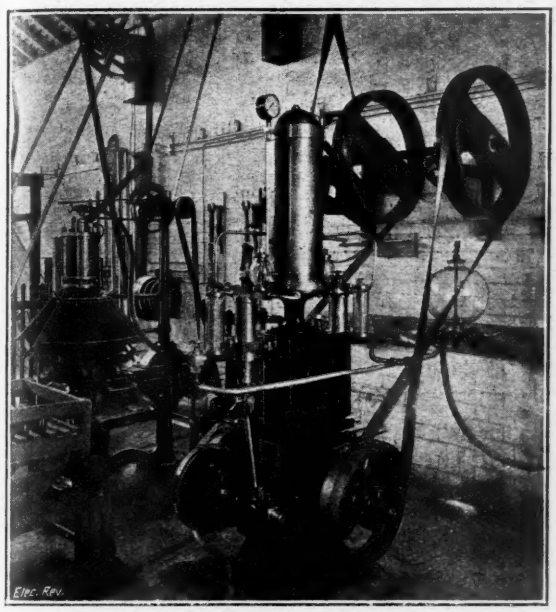
Although somewhat beyond the scope of this article, we may mention that electric lighting and "other uses" of electricity have made great progress in Hereford, which, as a country and market town, possessing a fine cathedral and historical associations extending back some 800 years, is a favoured residential centre. Practically every public building is electrically lighted; this applies to all the churches and the cathedral, in which the Gilbert Scott lighting fittings have been converted and some 360 lamps are installed.

As regards "other uses," about 120 kw. of electric heating and cooking apparatus is in use in the city, including about 200 irons; six consumers have adopted electric cooking and heating extensively, but pending improved manufacturing methods in the way of standardised replacements, &c., this branch of the supply business is not being pushed.

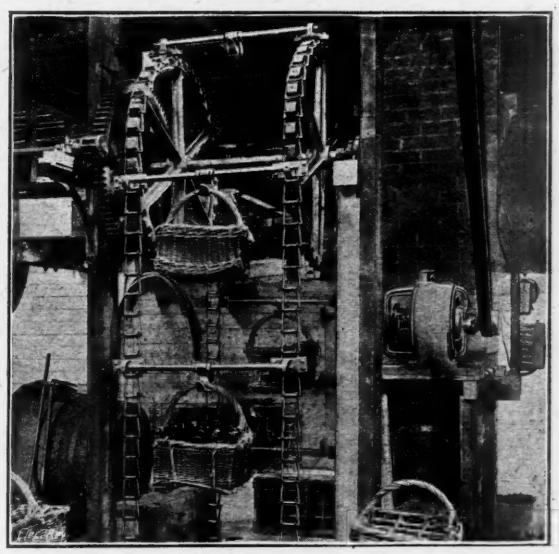
Still, where used, electric cooking is giving satisfaction, and it will undoubtedly be adopted both in the city and by the larger houses served in conjunction with the farms. The electricity department has also taken the first steps to introduce the electric vehicle in Hereford, by using a light electric truck for its own work about the town, and we gather that inquiries for delivery vans of this type have resulted.

This brings us to another interesting point; successful as have been the initial efforts to supply outlying farms and houses, there is a limit to the load which can be taken on the low-pressure direct-current overhead lines, and the increasing demands for electric power, lighting, cooking by those adjacent to the transmission routes has led Mr. Kerr to formulate a much more ambitious scheme—which is, unfortunately, deferred, owing to the war—by means of which the supply will be available anywhere within a five-mile radius.

This anticipates the installation of a 1,250-kw. three-phase turbine plant to supply current at 3,300 volts pressure by means of overhead transmission in the surrounding

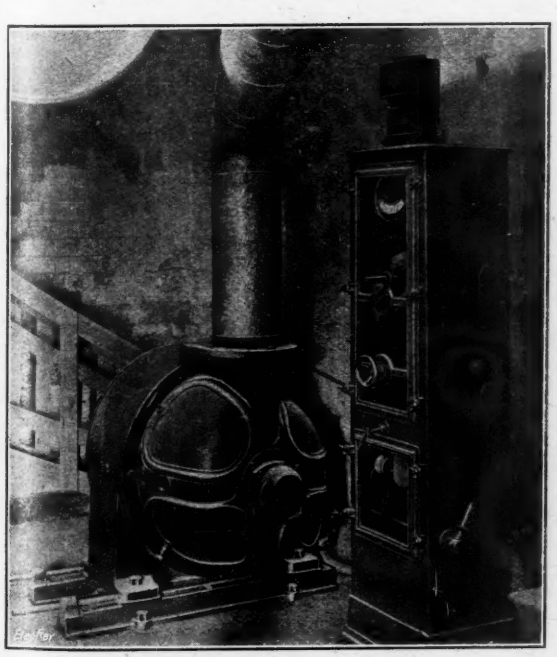


Aerating Machinery.

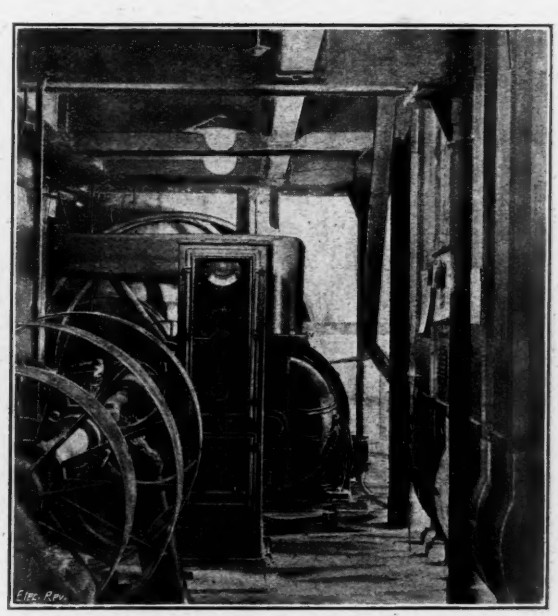


Bottle Hoist.

Electric Driving in Cider Mill, Hereford.



35-h.p. Pipe-Ventilated Motor.



75-h.p. Motor Driving Roller Mill.

Electrical Flour Mill Drives, Hereford.

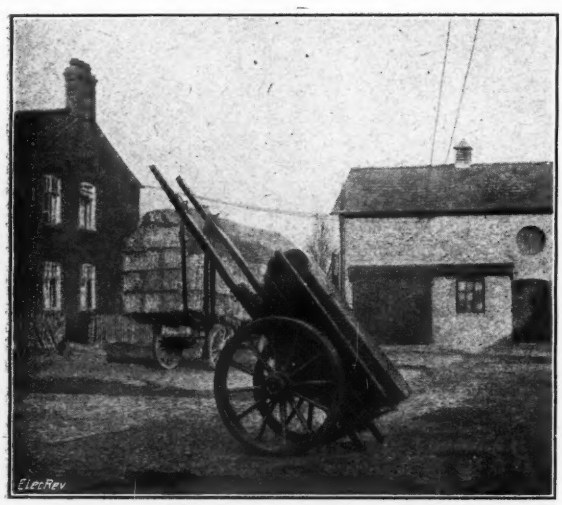
districts. It is estimated that the saving in fuel cost alone over the existing plant would justify the departure, and that very many farming and other consumers would become accessible to the undertaking.

Motor and Food-Preparing Machinery on an Altrincham Farm.

We are much indebted to Mr. Kerr for discussing the peculiar supply problems of the Hereford area with us; the results which he has achieved, and the methods adopted to secure them, deserve the careful study of all central station engineers situated in, and mainly dependent on, an agricultural area for future success.

Farm Supply at Altrincham.—The Altrincham Electric Supply, Ltd., has recently given a supply to a local 285-acre farm, where about 30 lights are installed in the house, all farm buildings and yard, and only electricity is used. The entire farm plant, including a corn mill, chaff cutter, root pulper, cake mill, &c., is driven by a 7½-B.H.P. 100-volt single-phase motor fixed in the granary.

The wiring in the farm buildings is generally in porcelain cleats on the surface, and the farm is supplied at 2,000 volts, 80 cycles, through half a mile of concentric cable laid across the consumer's land, at about 2-ft. depth, the pressure being transformed down to 100 volts, and metered at the farm. The consumer pays 6d. per unit for lighting and 1½d. for power, and it is understood that he would have been well satisfied if his first quarter's bill had been three times as large, despite the fact that it was swollen by sundry demonstrations for the edification of neighbouring farmers.



Farmyard Wiring, Altrincham.

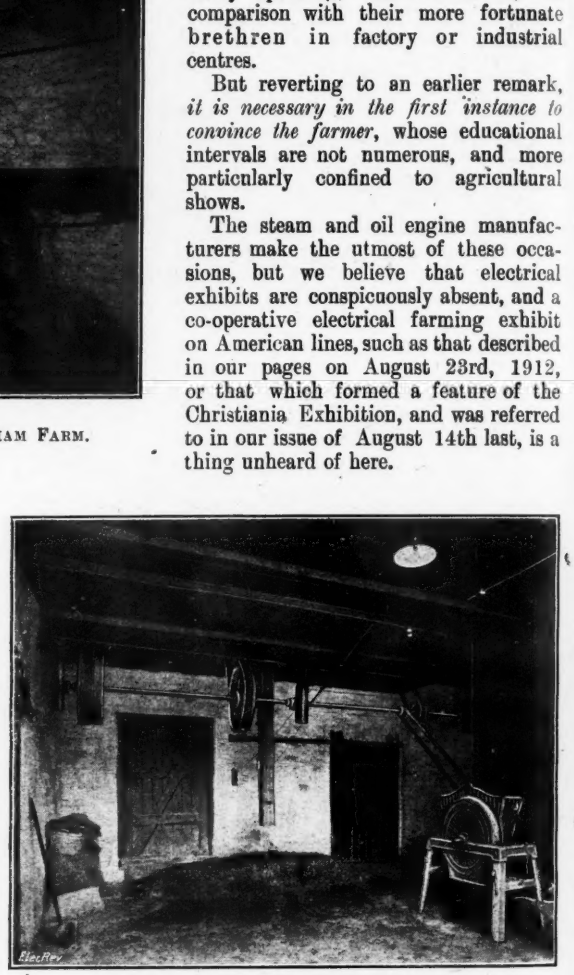
This installation was responsible for another farmer taking a supply for lighting and power from the company within a month.

We are indebted to Mr. Fawcus, the chief engineer of the company, for these particulars and accompanying views; we gather that he also is favourably impressed with the prospects for farm supply in his district.

Sufficient has been said to indicate that this subject has a real interest to a numerous class of supply engineers in this country, who have been, figuratively speaking, "all out of it," in comparison with their more fortunate brethren in factory or industrial centres.

But reverting to an earlier remark, *it is necessary in the first instance to convince the farmer*, whose educational intervals are not numerous, and more particularly confined to agricultural shows.

The steam and oil engine manufacturers make the utmost of these occasions, but we believe that electrical exhibits are conspicuously absent, and a co-operative electrical farming exhibit on American lines, such as that described in our pages on August 23rd, 1912, or that which formed a feature of the Christiania Exhibition, and was referred to in our issue of August 14th last, is a thing unheard of here.



Drive for Pulping Machine; Electric Wiring, &c.

Testimony to the value of the "personal demonstration" comes from far-off New Zealand, where the farmer shareholders of the Tai Tapu Co-operative Dairy Co., as a result of a short experience of its electrical operation—made possible by the advent of hydro-electric power—decided that they must have electric light and power on their own farms, and a scheme for that purpose has been organised.

Almost every house and farm in the district has decided to use electric light, and numerous shearing plants and a dozen milking plants are to be connected, while one farm is adopting electric cooking and heating throughout.

Three overhead lines covering 12 miles of route will couple the factory, which will be a central distribution point, and consumers; the latter average four per mile, and will be charged at fixed rates, no meters being used.

The question of method of charging is important; under the fixed-rate system the farmer knows exactly what his electricity is going to cost him, and this is what a good many English farmers will want to know, although they may have only the haziest idea as to the cost of running a steam plant for similar work.

In this country such rates as 6d. per unit for lighting and 2d. to 2½d. per unit for power are really an attractive proposition to the farmer, but it is advisable to offer a sliding scale down to the 1d. rate, which the farmer may calculate on reaching, even though in practice he never does so.

In conclusion, it seems obvious that good results are almost

certain to be obtained by demonstrating to the farmer what can be done by electricity, and arrangements should be made between the agricultural machinery and electric manufacturers to carry out this work at agricultural shows, &c.

We would suggest that this matter is sufficiently important to attract the attention of the I.M.E.A., many of the members of which body are situated in agricultural areas which must of necessity be made to yield some revenue in the future if the supply undertakings are to maintain a reasonable rate of progress. The fact that at least a quarter of the undertakings in the county fall within this category is significant.

ECONOMIC OPERATION OF ELECTRIC OVENS.*

By PERCY WILCOX GUMAER.

EVEN to-day very little is known of the proper conditions of time and temperature to use in cooking various articles of food so as to secure the greatest efficiency. With electric cooking the temperature at which food is cooked makes a considerable difference in the cost of the cooking.

In order to determine the losses of energy in electric cooking and the best methods of preparing various articles of food in electric ovens, tests were made on three commercial ovens and an experimental oven. Each commercial oven was selected as representing a general type of electric oven in use for domestic cooking.

FIG. 1.—OVEN NO. 1.

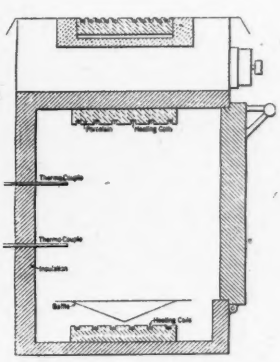


FIG. 2.—CROSS-SECTION OF OVEN NO. 1.

Oven No. 1, as shown in fig. 1, is a large range suitable for a good size family. The inside dimensions of the oven are 12 in. by 12 in. by 18 in. Two heating units are used, one in the top and one in the bottom of the oven. Each unit consists of two heating coils controlled from a snap switch on the front of the oven so as to consume 220, 440, or 880 watts. From one to two inches of mineral wool is used as heat insulation. The outside surface of the oven is blued steel with nickeled legs and trimmings. The oven door is 12 by 18 in. and 1.5 in. thick. It fits tightly and clamps securely in place when shut. Three heating units are also placed on top of the stove for the cooking which is not done in the oven. Fig. 2 is a cross-section of the oven showing the position of the heating coils and the thermo-couples used to measure the temperature.

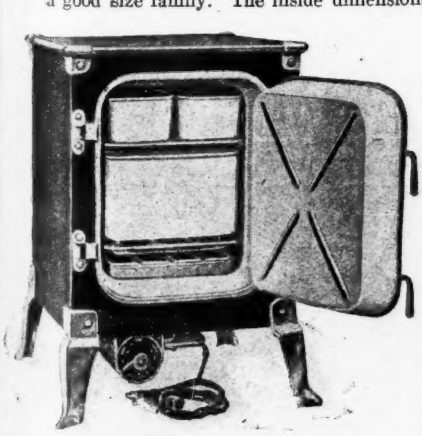


FIG. 3.—OVEN NO. 2.

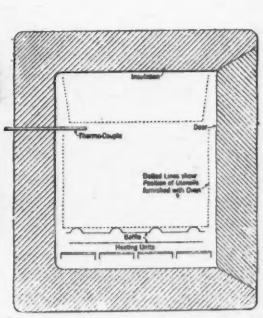


FIG. 4.—CROSS-SECTION OF OVEN NO. 2.

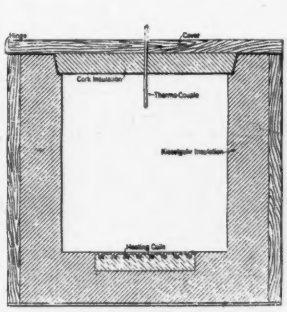


FIG. 5.—CROSS-SECTION OF OVEN NO. 3.

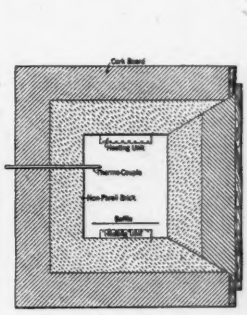


FIG. 6.—CROSS-SECTION OF OVEN NO. 4.

Oven No. 2, as shown in fig. 3, is a small well insulated oven suitable for a small or medium size family. The inside dimensions of the oven are 9.5 in. wide, 10 in. deep, and 12 in. high. The inside finish is seamless drawn alumnium, and the outside is blued steel with nickeled trimmings. Two and one-half inches of mineral wool is used for heat insulation. An iron-clad heating element is placed in the bottom of the oven, and consumes 500 watts when connected to a 110-volt circuit. The heat cannot be turned partly off, as there is only one heating element. Underneath the oven is an automatic temperature control, which may be set at various values by means of a dial. The dial is graduated in arbitrary numbers from one to eleven. When the handle of the dial is set at a given number a thermostat will open the circuit of the heating element as soon as the inside of the oven has reached a certain temperature; as the oven cools the thermostat must be reset by hand by pushing the handle of the dial. Fig. 4 is a cross-section of the oven showing the position of the heating coil and the thermo-couple.

Oven No. 3 is one of the well-known makes of fireless cookers with a heating element placed underneath the inner lining. The inside dimensions are 10.5 in. deep and 12.5 in. diameter. The inside lining is seamless drawn aluminium, and the outside finish is varnished oak. The sides and bottom are insulated with powdered kieselguhr, while the cover is insulated with granulated cork. Fig. 5 is a cross-section of the oven showing the position of the thermo-couple and heating coil. The oven uses 500 watts at 110 volts. There is no method of turning the oven partly off.

Oven No. 4 was constructed by the author so as to obtain data on the characteristics of an especially well insulated oven. The inside dimensions were the same as oven No. 2. A 220-, 440-, 880-watt heating unit was placed in the bottom of the oven and a 440-watt unit in the top as shown in fig. 6. Sheet iron was used for the inside lining. A 4-in. layer of a commercial brand of diatominous insulating brick was used for insulation. Later 4 in. of cork board was added as shown in the drawing. This was put on with cement, and no outside covering was used except on the front and the door, which were covered with wood.

The temperature of the ovens was measured by means of copper-constantan thermo-couples.

In oven No. 1 an extra thermo-couple was inserted for measuring the internal temperature of food.

The effect of heat on the protein of foods is to coagulate it. This change occurs at the comparatively low temperature of 75 deg. C. If the temperature is increased much above this point the protein tends to shrink and harden, and the digestibility of the food is greatly lessened thereby.

The effect of heat on the starch of foods is to make it more digestible. The starch is gelatinized at temperatures much below the boiling point of water.

The fat of foods is practically unaffected chemically by the degree of heat used in cooking.

The ideal preparation of food for human use requires that the nutriment which it contains shall be utilized to the fullest extent. Not only should the food be in such a state that the digestive juices can best act on it, but these digestive juices should be properly stimulated to do their work, by improving the taste or flavour of the food.

The present day problem is to determine the methods of cooking which will yield the most in nutrition and flavour with a minimum expenditure of fuel and labour.

Except in a few localities, for the same number of heat units delivered at the meter, electricity is more expensive than gas or coal. Hence, it is only by studying carefully the most economical features of design and operation of electric cooking apparatus that electricity will be able to compete with gas

* From the *Proceedings* of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Abstract.

and coal. A study of the heat losses in cooking is, therefore, of considerable importance to the designer of electric cooking apparatus.

Heat is lost in two ways—by convection and by radiation. The amount of energy radiated depends upon the nature of the surface, the temperature of the surface, and the temperature of the surroundings. It is independent of the shape of the radiating surface. The convection loss, however, depends upon the shape and the position of the surface, as well as the temperature of the surface and the surroundings. It is independent of the nature of the surface.

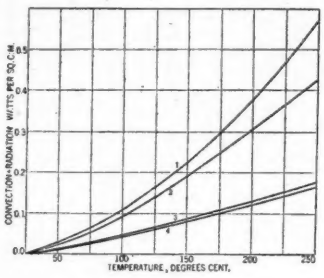


FIG. 7.

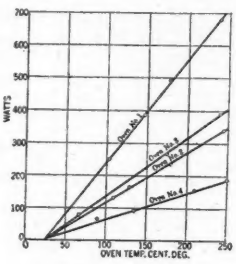


FIG. 8.

FIG. 7.—TOTAL LOSSES FROM HEATED SURFACES IN AIR.

1. Black body.
2. Oxidized copper.
3. Pure silver.
4. Convection only.

FIG. 8.—ENERGY REQUIRED TO MAINTAIN OVENS AT CONSTANT TEMPERATURE.

Fig. 7 shows the convection and radiation losses for vertical plane surfaces for temperatures up to 250 deg., the highest used in cooking.

As shown by the curves, the radiation loss from a black body constitutes a large part of the total loss, while the radiation from a polished silver surface forms but a small part of the total loss. For all other surfaces the radiation loss lies between that of a silver surface and a black surface, the convection being the same for all surfaces.

Since the convection and radiation losses depend on the temperature of the outside surface, the losses will be greatly reduced if this temperature can be decreased.

Suppose that enough heat insulation were introduced to reduce the outside temperature from 200 deg. to 110 deg. C., the watts lost per sq. cm. of outside surface would be reduced from 0.37 to 0.12.

Another method of reducing the heat losses would be to silver-plate the outside of the oven. The heat loss would then be decreased from 0.37 watt per sq. cm. to 0.13. By a combination of the two methods the input of the oven for a given internal temperature would be reduced from 1,000 watts to 165 watts.

To silver-plate the outside surface of an electric oven would be too expensive, but a white enamelled surface would be much more efficient than the black surface. A place in which nickel plating could be used to good advantage would be around the edge of the oven door, where the outside temperature of the oven is considerably higher than elsewhere.

The heat losses for the ovens tested were obtained, and curves were plotted between oven temperature and watts input as shown in fig. 8. These curves are very useful in comparing the economy of various ovens for the cooking of any article of food. Since one point of the curve will be zero energy at room temperature, only one determination is necessary to plot the curve for any particular oven.

The heat losses of an electric oven may be separated into the losses occurring before and after the food is inserted in the oven. In many kinds of cooking, such as baking biscuits and cake, the food must be placed in a hot oven as soon as it is prepared. The amount of energy required to preheat an oven to the desired temperature depends on the insulation of the oven, its size and the thermal capacity of the inside, and the size of the heating coils. The amount of energy required to preheat the ovens tested is shown in fig. 9. It will be noticed that, although oven No. 4 was better insulated than oven No. 2, it required more energy for the preheating. This was probably due to the greater heat capacity of the inside lining and the insulation. The effect of too small a heating coil is shown by the curve for oven No. 3; the time required for the oven to reach a baking temperature of 250 deg. C. was 2.5 hours.

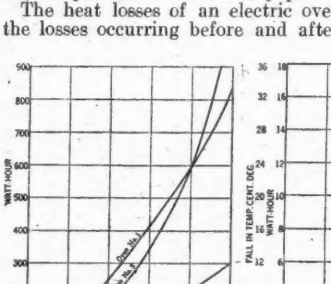


FIG. 9.

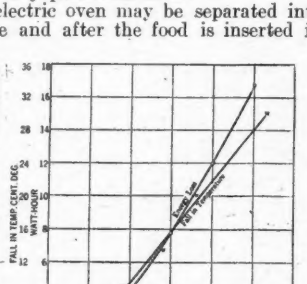


FIG. 10.

FIG. 9.—ENERGY REQUIRED TO PREHEAT OVENS.

FIG. 10.—EFFECT OF OPENING DOOR OF OVEN NO. 1 FOR 15 SEC., UPON ENERGY LOST AND FALL IN TEMPERATURE OF THE OVEN.

In preparing food which cannot be placed in a cold oven and heated gradually, there is a loss of heat when the oven door is opened.

Fig. 10 shows the watt-hours lost each time the door of oven No. 1 is opened for 15 seconds, and the fall in temperature of the oven when the door is opened at different oven temperatures.

Experiments have demonstrated that beef can be satisfactorily roasted at an oven temperature anywhere between 100 deg. and 200 deg. C. No difference was discernible in the tenderness of duplicate roasts cooked at the extremes of temperature. The most satisfactory temperature within this interval can be determined only by the consideration of other factors, of which the time of cooking and the cost of cooking are the most important. In order to determine this most economical temperature for roasting a rolled rib roast, a series of experiments were performed on 22 roasts. The meat was freed from bone and tightly rolled and secured with wooden skewers. Samples were roasted at 100, 120, 140, 160 and 180 deg. C. The time required for the cooking and the amount of energy used at each oven temperature were measured. From these values the most economical temperature was determined.

The aim in cooking meat is not to increase its digestibility but to improve its flavour and appearance, by decomposing the red colouring matter called oxyhæmoglobin, which removes the raw appearance of the meat. The inside of the roast should be heated sufficiently to accomplish this without over-coagulating the proteids or removing from the meat those substances which tend to become soluble or volatile upon the application of heat.

In order to secure as much uniformity as possible in the results, a definite internal temperature was taken as the indication of when the meat was sufficiently cooked: 55 deg. C. was used for rare, 65 deg. for medium rare, and 75 deg. for well done.

A copper-constantan thermo-couple was used to measure the temperature inside the roasts.

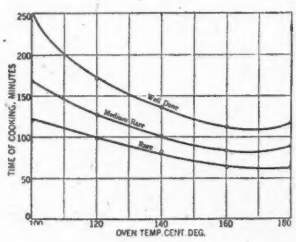


FIG. 11.

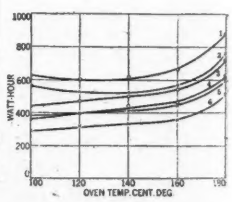


FIG. 12.

FIG. 11.—EFFECT OF OVEN TEMPERATURE ON TIME OF COOKING OF BEEF ROASTS.

FIG. 12.—ENERGY REQUIRED TO ROAST BEEF IN OVEN NO. 2, STARTING WITH OVEN HOT AND WITH OVEN COLD.

1. Well done roast, oven cold.
2. ,, ,, ,, ,, hot.
3. Med. rare ,, ,, cold.
4. Rare roast, oven cold.
5. Med. rare roast, oven hot.
6. Rare roast, oven hot.

The authorities on meat cooking recommend that a roast be cooked for the first 10 or 15 minutes at an oven temperature of 250 deg. C., so as to sear the outside of the meat. The theory is that the coagulation of the outer surfaces of the meat will act as a seal to keep in the meat juices and volatile flavours. A consideration of the heating curves of the electric ovens discussed in the first part of this paper shows that to heat an oven up to 250 deg. C. and to keep it there for 15 minutes will increase the cost of electricity for roasting the meat about 50 per cent. In order to reduce this extra cost of energy another method was tried which proved very successful. Instead of searing the meat in the oven at a high temperature it was seared on the top of the stove, or, rather, by placing the meat in an aluminium dish over an 880-watt heating coil. The current was turned on for three minutes to get the dish quite hot. The meat was then placed in the hot dish and seared for ten minutes, being turned frequently so as to sear all sides.

After searing, an incision was made in the roast with a sharp narrow-bladed knife, and the thermo-couple was inserted as near as possible in the centre of the roast. The roast was then placed in the oven at the desired temperature. Placing the roast in the oven lowered the temperature by 10 to 20 deg. Full current was turned on until the temperature returned to the desired value; after that the temperature was kept constant within 2 deg. C.

When the temperature inside the roast indicated the meat to be cooked rare, the time and watt-hour readings were recorded. This was also done for medium rare and well done.

Fig. 11 shows the average time of cooking plotted against oven temperature. It will be noticed that at an oven temperature of 160 deg. C. the roasts are cooked in a shorter length of time than at 180 deg. This is probably due to the fact that the slightly charred surface of the meat is a poorer conductor of heat.

The per cent. loss in weight of the roasts increases with the temperature. As far as the losses in cooking a well done roast are concerned, meat is best when cooked between 100 and 120 deg. C., or possibly lower.

The other important factor which determines the best roasting temperature is the cost of the electricity used. The curves of fig. 12 give the energy used in roasting beef in the oven No. 2. The additional energy used in searing the roasts was the same in all cases, 190 watt-hours. It will be noticed that for rare and medium roasts 100 deg. is the most economical temperature. For all the ovens the most economical temperature for well-done roasts lies between 120 and 140 deg. C.

The energy required for roasting meat in oven No. 1 is considerably greater than for oven No. 2. This is due partly to the smaller amount of heat insulation used and partly to the larger size of the oven.

The saving in energy in favour of searing on top of the stove is surprisingly great, making a difference of $.05 (at $.05 per kw.-hr.) in the cost of preparing the roast.

A series of experiments were undertaken on the baking of biscuit, bread, and sponge cake, to determine the range of temperatures within which each article of food could be satisfactorily baked and the particular temperature within this interval which was the most economical for the ovens tested.

The range of temperature for baking biscuits was from 200 to 240 deg. C.

Fig. 13 shows the minimum time of baking and the per cent. loss of weight curves for the bread experiments. The loaves averaged 300 gm. in weight and were baked in a tin the dimensions of which were 3 in. by 5 in. by 3 in. deep.

In the bread experiments the most satisfactory results were obtained above 180 deg. At the lower temperatures the crust

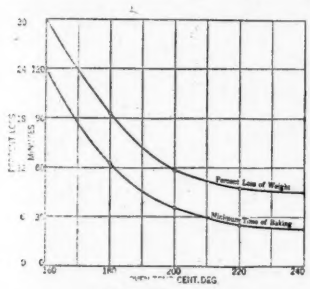


Fig. 13.

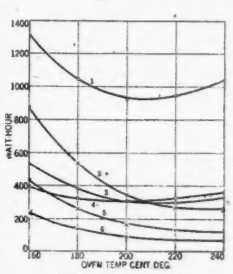


Fig. 14.

Fig. 13.—Effect of Oven Temperature on Time of Baking Bread and per cent. Loss of Weight.

Fig. 14.—Energy required to Bake Bread Starting with Oven Hot and with Oven Cold.

1. Oven No. 1 cold.	4. Oven No. 4 cold.
2. ,, ,, 1 hot.	5. ,, ,, 2 hot.
3. ,, ,, 2 cold.	6. ,, ,, 4 hot.

was hard and thick, due to excessive evaporation of moisture as indicated by the loss in weight curve. At 240 deg. the outside of the loaf had a tendency to brown over before the inside was thoroughly done.

The time required for baking a larger loaf would be somewhat longer.

The range of temperature for baking sponge cake lies between 170 and 200 deg. C.

If biscuits are baked immediately after other food is removed from the oven, so that preheating is not necessary, the energy required will be very small compared to the amount required if the oven has to be heated up from room temperature to baking temperature.

Because the conditions of baking biscuits satisfactorily are a high temperature for a short time, ovens used for this purpose should require as little energy as possible for preheating.

The curves of fig. 14 give the energy used in baking bread at the various oven temperatures with and without preheating. It will be noticed that for all the ovens the energy required is a minimum above 220 deg. The most economical temperature for baking bread when the oven is already heated is, therefore, from 220 to 240 deg. C.

The temperature for which the energy required is a minimum lies between 200 and 215 deg. C., depending on the oven used. Although the insulation of oven No. 4 is very much better than that of oven No. 2, it will be noticed that above 205 deg. oven No. 4 requires more energy for baking bread than oven No. 2. This is due to the larger amount of energy required for the preheating.

Consideration of the baking curves as a whole will emphasise the importance of the preheating characteristics in designing an efficient electric oven. For the kind of baking which requires a high temperature for a short time the preheating loss is considerably greater than the radiation and convection loss. Unless some method can be found for decreasing the energy used in heating the oven up from room temperature, it will not be practical greatly to increase the heat insulation of the ovens used for domestic baking. This does not apply, however, to ovens which are used for long intervals at the same temperature.

With the advent of electric ovens a revolution in the methods of cooking has become possible. Automatic electric ovens will probably be developed in which the temperature will be accurately controlled and the necessity of constant vigilance will be removed.

The present-day problem in electric cooking is to determine the methods of cooking that will yield the most in nutrition and flavour, and to formulate definite rules or directions so that a particular article of food can be cooked in the best possible manner by persons of ordinary skill. The engineer's problem is then to design practical cooking devices in which the temperature can be accurately regulated with a minimum of attention on the part of the housewife.

The increased popularity of the fireless cooker indicates that people are learning that food can be cooked at temperatures lower than the boiling point of water. The fact that several hours are required for the cooking is not a disadvantage when the process is automatic and does not require the attention of the housewife. Four hours would probably be the best time to cook the food. The housewife could put in the food for the mid-day meal immediately after breakfast while the oven was still hot. When it is taken out she could put in the evening meal, so that the oven would be used continuously. The preheating loss would thus be reduced to a minimum. During the latter part of the afternoon the housewife need not be tied to her kitchen, as all that would be necessary at this time would be to dish up the food and serve it.

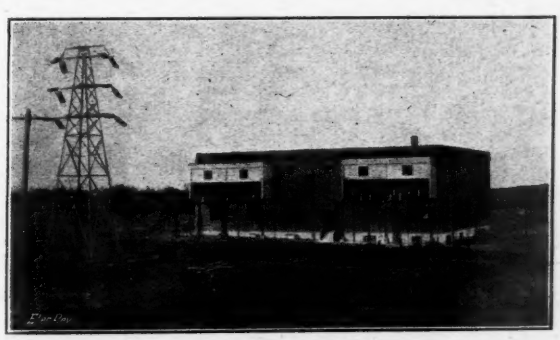
The electric light and power companies should be interested in perfecting this method of cooking and in bringing it to the attention of their customers. A combination of the electric oven and the popular fireless cooker would be a very desirable load for the central station. It would be a nearly steady all-day load and would not interfere with the peak load even in the winter, as sufficient heat can be stored in a well-insulated oven to keep the food hot enough to serve for an hour or more after the current is turned off.

The results of the cooking experiments in electric ovens indicate that it is possible to reduce the art of cooking with electricity to an exact science. If definite rules of time and temperature were formulated for cooking each article of food, the inexperienced housewife could obtain uniformly good results with the expenditure of a minimum amount of attention and fuel.

THE REPORT OF THE ONTARIO HYDRO-ELECTRIC COMMISSION.

The seventh annual report of the Ontario Hydro-electric Commission, which covers the year's working to October 31st, 1914, fills a bulky volume, which, with its numerous illustrations and detailed statistics, one must suppose forms the most complete annual electric supply report in existence.

The total capital expended to October 31st last on the Niagara, Severn, Wasdell's, St. Lawrence, Eugenia, Port Arthur and Renfrew systems, and on municipal construction, etc., amounted to $10,130,048, of which some $4,390,000 was expended during the year. The Commission is constantly

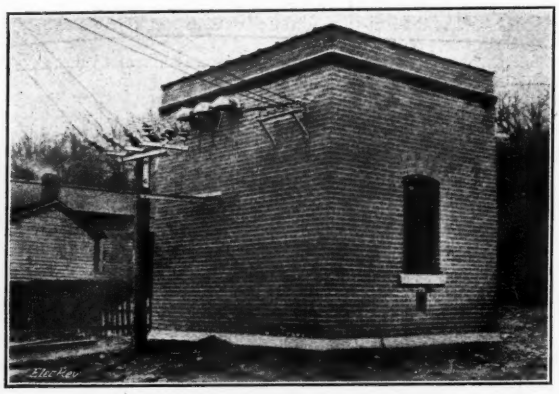


Large Transformer Station, Ontario Hydro-Electric System.

adding to its consumers, and the accounts of 69 municipalities who are consumers have been consolidated in the present report, which shows that as at December 31st last, these also have made investments in distributing plants to the extent of $15,249,203, carrying annual debt charges of $661,949.

Including operating charges these municipal undertakings cost for the year $2,674,703, and earned $3,433,936, leaving a gross surplus of $759,232, or deducting depreciation, a surplus of $401,349. The accumulated surplus (3 years) invested in plant extensions, is $1,601,167 (from 63 municipalities), and deducting $850,618 for depreciation reserve, the surplus of $750,549 is over 10 per cent. on the revenue of the three years.

The report says, "the result is of particular interest and value as it is the final answer of the municipalities to their experiment in the co-operative transmission and municipal distribution of hydro power." The total number of consumers



STANDARD DISTRIBUTING STATION.

was 96,744, of which 93,179 were lighting and the rest power consumers. The highest cost per KW.-hr. for domestic lighting was 10.9c. and for commercial lighting, 9.4c.; the respective average costs were 4.8c. and 3.9c.

The Niagara system is, of course, the principal one controlled by the Commission, having 609 miles out of the total of 800 miles of secondary transmission lines connected; the pressure of these lines varies from 46,000 to 2,200 volts. The yearly average H.P. of the Niagara system is over 50,000, while the connected power load is about 68,000 H.P. The total transformer and distribution station capacity of this system is 183,440 K.V.A. (including Niagara station, 80,500 K.V.A. and Toronto station, 25,000 K.V.A.), while for the whole of the Commission's systems, the capacity is apparently over 193,000 K.V.A.

During the year important extensions were carried out to the transmission system. A duplicate line from Niagara to Dundas, 50 miles, has been completed, using copper cable and tandem steel tower construction, with standard spans of 630 ft.

The first of the Commission's own power plants, at Wasdell's Falls, was brought into operation, this being a 1,200-H.P. hydro-electric plant.

The Eugenia Falls scheme which will develop 8,000 H.P., is now being carried out, the initial installation calling for two 2,250-H.P. turbines.

On account of the widening and deepening of the Welland Canal by the Dominion Government, it was necessary to lengthen the spans across the canal from 407 to 532 ft. To do this, one standard tower was removed from the transmission line, one anchor tower was moved 45 ft. and the two high towers supporting the canal crossing span were moved, one 63 ft. and the other 62 ft. The important part of this work was the moving of the two latter towers; each weighed 25 tons and was supported on a heavy reinforced concrete base; the overall height was 168 ft. These towers were moved standing, being pulled along timber skidways to new concrete foundations. To maintain continuity in supply, two temporary crossing lines were built north and south of the crossing, far enough apart to allow of a vessel in between, and by this means a boat could pass through with very little delay and without having a complete shut-down of the power circuits.

As many distributing stations are required to meet similar demands, the Commission has prepared standard designs and layouts, covering eight capacities, from 3-25 K V.A. to 3-150 K.V.A. transformers.

Under the section devoted to "operation," the report states that the power furnished to the Commission by the Ontario Power Co. had been practically continuous during the year. The greatly reduced number of H.T. interruptions due to insulator trouble, indicates the efficiency of the arrangements now in use for eliminating defective insulators.

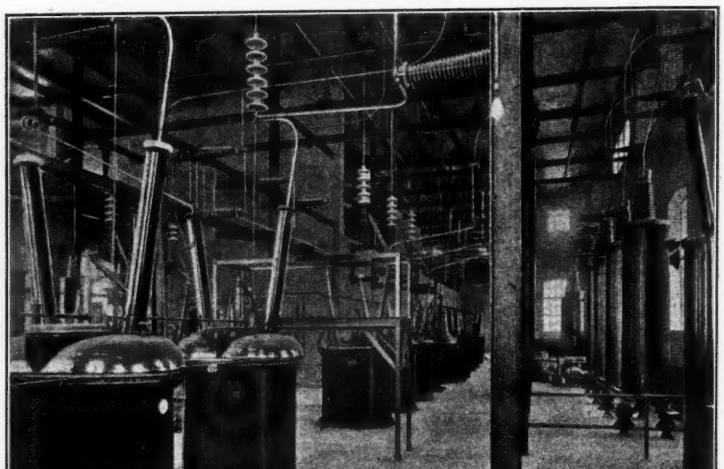
Thirty-three different electrical storms were reported over the system, and of these ten were severe and the rest moderate. They occurred between March 25th and October 10th, and seven of them traversed the whole system.

There were two total interruptions of service, due to lightning and only momentary. The operating characteristics of the steel reinforced aluminium transmission cable used on recent work have proved very satisfactory, and confirmed the advantage over the straight aluminium cable, which was expected.

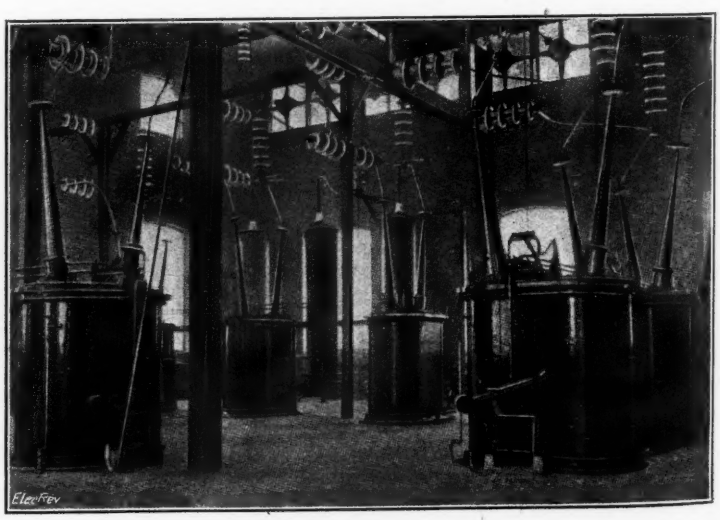
All the municipalities under the control of the Commission have now adopted a standard schedule of rates; for domestic service this year the "service" charge is 3 cents per month per 100 sq. ft. of floor area, with a minimum charge on 1,000 sq. ft in cities; 1,200 sq. ft. in villages; or 1,500 sq. ft. in suburban districts, and a maximum service charge on 3,000 sq. ft. An additional consumption charge per unit is made, and a 10 per cent. discount is given for prompt payment. What is known as a "follow-up" rate (and has been used in this country with another name) is offered: all energy consumed over a certain amount being charged at half the recognized consumption rate. Commercial and street lighting rates are offered and power rates based on a charge of $1 per month per H.P. of connected load or maximum demand and three consumption charges, varying according to locality, for the first and second 50 hours' and subsequent use of the load.

In addition power consumers are divided into four classes, *i.e.*, 24 hrs. unrestricted and restricted users and 10 hrs. unrestricted and restricted users, and they receive discounts, amounting to 33⅓ per cent. in the latter case.

The Commission has a Purchasing Department whose services are offered to any municipality or institution in Ontario; about $600,000 worth or material was purchased during 1914



H.T. ROOM, LONDON TRANSFORMER STATION, ONTARIO.



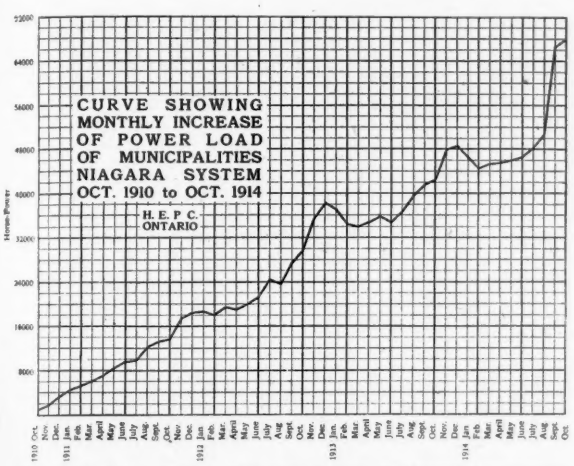
H T. ROOM, BRANT TRANSFORMER STATION, ONTARIO.

in this way, and savings of from 10 to 50 per cent. made in transformers, meters, lamps, and wire.

During the year an Electrical Inspection Department has been formed, and seventy municipalities have appointed inspectors.

Farming Supply.—Arrangements were made with a number of manufacturers for the erection of a model Barn and Dairy, which were electrically driven by a 5-H.P. and ½-H.P. motor respectively, and used for demonstration purposes at the Canadian National Exhibition, 1914. Each manufacturer had a demonstrator with his apparatus, and the opportunity was taken to instruct farmers as to supply facilities.

The exhibit was electrically lighted by a system installed in conduit, and a "Syndicate" electric outfit for silo filling and threshing, consisting of a 20-H.P. motor installed in one wagon, the necessary transformers, meters, and connections



NIAGARA LOAD CURVE, ONTARIO HYDRO-ELECTRIC COMMISSION.

installed in another wagon, and one of the largest ensilage cutting boxes was also shown. Demonstrations of electric household and farming appliances were made at numerous fairs and exhibitions throughout the area.

The advantages of electric power over steam, gasoline, windmill, and sweep power are quite apparent to the farmer in most districts, but the question with him is how he can apply the power so as to receive full value for the money expended per year for service and power. To make proper comparison the value of the farmer's and his assistants' time has to be taken into account; until recently the farmer would not concede that his time was worth "so much per hour." Electricity in rural sections is supplied for farm lighting, power and cooking, including power for threshing and silo-filling. Also to brick and tile yards, saw mills, cheese and butter factories, pumps, chopping and flour mills, beet sugar factories, quarries, street lighting, etc.

Electric lighting is greatly appreciated by the farmer as relieving the dull appearance of the farm, decreasing the fire risk, etc.; in barns it is found necessary to run the wire in conduit.

The cost of such installations in Canada varies for open wiring from $1.25 to $1.75 per outlet, and for concealed wiring from $1.50 to $2.25 per outlet. Surface conduit installations in farms and farm buildings vary from $3.25 to $4.50 per outlet; the figure does not include fixtures, but includes switches. An interesting series of tables are included relating to farm uses of electricity, of which we give some abstract data in tables I.-III.

The totals are given below table II.; the service charge is $2.40 per month, and the current charge 4½c. per KW.-hour, with a 10 per cent. discount on the latter only.

[The revenue from the six farmers amounted to about £88-89 for domestic uses and one motor; the same revenue would be obtained in England with rates of 6d. per unit for lighting and 2d. per unit for power.]

Table III.—Total KW.-hours, 5,524; av. cost per KW.-hour, exclusive of syndicate motor, 2.54c., and for all uses, 2.65c.

Similar data relating to five farms is given, from which it appears that electrical milking machinery costs between .18c. and .26c. per cow per milking for farms with from 12 to 30 cows, and together with lighting and water heating (where used) gives the biggest individual revenue items. The average yearly consumption per farm for the five cases, for all purposes, was 4,700 KW.-hours, and the average revenue per farm $134 (£27).

Municipal and Railway Work.—During the last two years 22 municipalities have consulted the Commission regarding their underground systems, and the question of street lighting has been considered at the same time. For ornamental street lighting the nitrogen-filled lamp has been used with advantage, and complete installations of these lamps have been made at Hamilton and Stratford. Resolutions have been received from 138 townships, 38 villages, 42 towns, 11 cities, etc., asking for reports and estimates on proposed electric railways; preliminary surveys have been made of some 1,200 miles of line.

Sections of the report deal with the work of the Commission's testing and research laboratories, and with hydraulic investigation and the construction of recent hydro-electric additions to the Commission's plant.

TABLE I.—COMPARISON OF ELECTRIC AND STEAM THRASHING COSTS ON VARIOUS FARMS.

Running time; hrs.	Bushels of grain.	KW.-hours used.	Cost At 4½c. per KW-h	Cost By steam.
15½	2,017	280	$12.60	$18.87 *
9½	1,380	174	7.83	16 62 *
7	710	130	5 85	7 00 *
34	3,000	297	13.37	34.00 †
30	2,290	665	29 93	30.00 †
14½	1,775	268	12.06	14 50 †
15	1,750	286	12 87	15 00 †
35	2,710	510	24.30	35 00 †
21	2,370	452	20.34	21 00 †

* By custom rig. † By syndicate rig, engine only, at $1 per hour.

TABLE II.—SIX FARMERS: DOMESTIC AND SYNDICATE MOTOR USES ONLY.

Domestic use. Average KW.-hours per day.	Domestic use. Estimated KW.-hours per year.	Syndicate motor, KW.-hours per year estimate.	Total KW.-hours per year, domestic and syndicate motor.	Cost per year current plus $30 service charge.
·84	306	836	1,142	$76.25
1·29	471	1,060	1,531	92.00
1 04	368	856	1,224	79.58
·8	294	505	799	62.35
·97	354	435	789	61.95
·82	297	746	1,043	72.24
5·76	2,090	4,438	6,528	$444.38

TABLE III.—DETAILS OF ENERGY USED ON ONE FARM.

Operation.	Times used per year.	Total hours per year.	H.P. of motor.	KW.-hours per year.	Cost of electricity.
Milking	660	440	2	748	$19.00
Grinding	12	84	5	315	8.03
Cream separating...		all	milk	sold	
Pumping	330	412	5	412	10.46
Sawing	—	—	5	19	.48
Thrashing... ...	—	—	25	216	8.64
Silo-filling... ...	—	—	25	178	7.12
Water heating ...	250	2,000	—	1,200	30.48
Vacuum cleaner ...	44	22	1/6	3	.08
Washing	36	18	1/6	2	.05
Electrical iron ...	44	176	—	88	2.24
Lighting	—	—	—	1,649	41.83

As regards testing, the peculiar characteristics of the demands of rural consumers which now form a rapidly increasing percentage of the Commission's power load, have called for special types of metering apparatus, and experiments have been conducted on various metering principles to meet the requirements.

Prolonged tests under actual conditions have been carried out on six types of electric cooking ranges, twelve makes of electric toaster, and 14 makes of electric iron.

The subject of street illumination was investigated; a large majority of towns use the series system of distribution, and 60—100-watt lamps equipped with radial wave reflectors.

In connection with the question of exterior illumination, extensive tests have been made on diffusing glassware, the results showing a consistent superiority of one make over the other.

Some 760 lots of lamps (representing 400,000) were tested during the year.

Advance in Prices.—THE WALSALL ELECTRICAL CO., LTD., announce that they have withdrawn all outstanding quotations from June 14th, excepting those given in within the last 30 days, which will hold good for a period of 30 days. They are at present rearranging their catalogue prices, and will notify the trade of their new prices in the near future. In the meantime they will be pleased to quote against specification.

NEW PATENTS APPLIED FOR, 1915.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

8,012. "Transmitter." H. J. C. FORRESTER (Piersen Telegraph Co., United States). May 31st. (Complete.)

8,019. "Construction of electro-magnets." STEEL, PEECH & TOZER, LTD., and H. E. BOWEN. May 31st.

8,028. "Electrical measuring instruments." H. C. WEST. May 31st. (Complete.)

8,041. "Electrical targets, in which projectiles are not actually fired." W. H. B. SIMMONDS & E. J. MATTHEWS (trading as E. J. Matthews & Co.). May 31st.

8,047. "Switches for lighting installations." R. BOSCH (firm of). May 31st. (Convention date, June 9th, 1914, Germany.) (Complete.)

8,052. "Magnetic sun-dial." J. H. L'ABEE LUND. May 31st. (Complete.)

8,060. "Electro-magnetic locking devices." L. CADENEL. May 31st. (Divided application on 13,715/14. Convention date, June 10th, 1913, France.) (Complete.)

8,074. "Electric meters of the reflecting type having negligible control." R. BEATTIE. June 1st.

8,090. "Apparatus (portable) for field and army use, combined telephonic and telegraphic." W. A. A. BROOKE. June 1st.

8,099. "Electric-light adjuster." R. E. TAFFINDER. June 1st.

8,100. "Electric radiators." J. R. QUAIN. June 1st.

8,106. "Alternating electric transformer protective arrangements." F. E. BEERY. June 1st.

8,107. "Oil-cooled transformers." BRITISH ELECTRIC TRANSFORMER CO., LTD., & W. MCWILLIAM. June 1st.

8,163. "Connectors for electrical signalling wires and cables." A. W. SCLATER. June 2nd.

8,169. "Electric hoisting equipment." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States). June 2nd.

8,173. "Vapour rectifiers." BRITISH WESTINGHOUSE ELECTRIC & MANUFACTURING CO., LTD. June 2nd. (Convention date, July 11th, 1914, United States.) (Complete.)

8,180. "Three-way switch for projectors and the like." R. BOSCH (firm of). June 2nd. (Convention date, February 18th, 1915, Germany.) (Complete.)

8,189. "Accumulator cases for motor vehicles." P. A. H. MOSSAY. June 2nd. (Complete.)

8,199. "Method of and means for transmitting signals to railway and tramway vehicles and for recording such signals and other data." W. F. J. H. BOUMAN. June 2nd. (Convention date, June 2nd, 1914, Holland.) (Complete.)

8,203. "Sound-transmitting means." P. J. HACKETT. June 2nd. (Complete.)

8,204. "Electrical batteries." W. HOPPIE. June 2nd. (Complete.)

8,221. "Adjustable terminal pin plate and flex grip plug top." H. A. DANES & J. T. BAGGOTT. June 3rd.

8,227. "Electrical generators." F. A. HEYS (Neuland Magnetos, Ltd., United States). June 3rd. (Complete.)

8,238. "Discontinuous wire telegraph systems." A. W. SHARMAN. June 3rd.

8,245. "Electric welding and apparatus therefor." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States). June 3rd.

8,268. "Multiple diaphragms." G. DALEN. June 3rd. (Complete.)

8,272. "Arc lamp with electrodes of highly refractory metals, tungsten in particular." ALLGEMEINE ELEKTRICITATS-GES. June 3rd. (Convention date, June 3rd, 1914, Germany.) (Complete.)

8,303. "Insulation division piece or partition for a controller arc deflector, circuit breaker, and the like." W. R. MCRAE & R. RUSSELL. June 4th. (Complete.)

8,305. "Method of and means for separating metals by electrolysis." A. WALKER. June 4th.

8,318. "Mechanism for operating electrically-worked tramway and railway track points." J. MURRAY. June 4th.

8,319. "Electric wiring systems." G. S. BOOTHROYD & CALLENDER'S CABLE AND CONSTRUCTION CO., LTD. June 4th.

8,321. "Apparatus for use in wireless telegraphy and the like." M. F. SUETER, R. M. GROVES, & B. BINYON. June 4th.

8,326. "Electric welding and apparatus therefor." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States). June 4th.

8,327. "Composite metal bodies." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States). June 4th.

8,332. "Holders for electric incandescent lamps." A. H. MIDGLEY & C. A. VANDERVELL. June 4th. (Complete.)

8,333. "Electric heating devices." JOH. KREMENEZKY (firm of). June 4th. (Convention date, June 9th, 1914, Austria.) (Complete.)

8,334. "Dynamo-electric driving mechanisms of the unipolar systems." M. BRESLAUER. June 4th. (Convention date, June 4th, 1914, Germany.) (Complete.)

8,358. "Field telephone and telegraph apparatus." H. NORTH. June 5th.

8,367. "Sparking plugs." M POGNON. June 5th. (Addition to 6,593/15. Convention date, June 16th, 1914, France.) (Complete.)

8,374. "Fluid-pressure braking apparatus." W. V. TURNER. June 5th. (Convention date, October 1st, 1914, United States.) (Complete.)

8,375. "Fluid-pressure braking apparatus." P. H. DONOVAN. June 5th. (Convention date, Nov. 25th, 1914, United States.) (Complete.)

8,376. "Safety device for use with electrically-driven vehicles." W. V. TURNER. June 5th. (Convention date, October 24th, 1914, United States.) (Complete.)

8,377. "Fluid-pressure governing mechanism." June 5th. (Convention date, November 25th, 1914, United States.) (Complete.)

8,378. "Fluid-pressure braking apparatus." W. V. TURNER & P. H. DONOVAN. (Convention date, February 10th, 1915, United States.) (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1914.

11,841. CONTROL APPARATUS FOR ELECTRIC LIGHTING SYSTEMS ON MOTOR CARS. F. E. Wilson. May 13th.

11,889. CONNECTION BOXES, JUNCTION BOXES, AND THE LIKE. St. Helens Cable & Rubber Co., and J. C. White. May 14th.

11,987. ELECTRICAL APPARATUS FOR AUTOMATICALLY LOCKING RAILWAY CARRIAGE DOORS WHILE THE TRAIN IS IN MOTION. E. Genders & H. B. Genders. May 15th.

12,047. SELF-PROPELLED VEHICLES. British Thomson-Houston Co. (General Electric Co.). May 15th.

12,350. MAGNETOS AND THE LIKE. H. Ford. May 19th. (Addition to 15,636/13.)

12,386. ELECTRIC METERS. British Insulated & Helsby Cables, Ltd., and L. B. Wilson. May 20th. (Cognate application, 15,615/14.)

12,551. ELECTRICAL HEATING APPARATUS. A. F. Berry. May 21st.

12,599. FITTINGS FOR METALLIC CONDUIT SYSTEMS FOR HOUSING ELECTRICAL CONDUCTORS. Simplex Conduits, Ltd., & L. M. Waterhouse. May 22nd.

12,885. ELECTRICAL SIGNALS IN MINES AND COLLIERIES. E. C. Theedam, Ltd. May 26th.

12,906. LAMP-LOCKING AND ANTI-VIBRATOR DEVICE TO INCANDESCENT ELECTRIC LAMPHOLDERS OF THE BAYONET SOCKET TYPE. C. Wharram. May 26th.

13,095. GALVANIC BATTERIES. A. Thomas & J. Stott. May 28th.

13,374. HIGH-FREQUENCY CURRENT RECTIFIER FOR RECTIFYING HIGH-FREQUENCY WAVE IMPULSES IN A WIRELESS RECEIVING CIRCUIT. C. S. Lenz. June 2nd.

15,356. ELECTRIC INDUCTANCE COILS FOR THE PROTECTION OF ELECTRICAL MACHINES AND CIRCUITS. J. S. Highfield & W. Duddell. June 26th.

15,681. APPARATUS FOR RECEIVING OR RELAYING ELECTRIC SIGNALS. G. W. Pierce. June 30th. (August 5th, 1913.)

15,868. ELECTRIC METERS OF THE INDUCTION TYPE. British Thomson-Houston Co. (General Electric Co.). July 2nd.

16,612. ELECTRIC HAIR BRUSHES. V. Sence. July 11th.

17,004. MACHINE SWITCHING TELEPHONE SYSTEMS. Western Electric Co. (F. T. Woodward acting for Western Electric Co.). July 17th.

18,092. ELECTRIC ACCUMULATORS OR SECONDARY BATTERIES. F. A. Coles. July 31st.

21,904. TELEPHONE CALL REGISTERING DEVICES. V. Thompson. November 2nd.

1915.

5,848. COMMUTATORS FOR DYNAMO-ELECTRIC MACHINES. T. Zimmerman. April 19th. (April 17th, 1914.)

The Fixation of Atmospheric Nitrogen.—A great electrical undertaking which is intended to furnish energy in connection with the fixation of atmospheric nitrogen for the production of calcium cyanamide, from which nitric acid is to be obtained for the manufacture of explosives, so as to render the country totally independent of external sources, in association with other works extracting nitric acid from synthetic ammonia, is now being taken in hand in Germany by the Berlin Electricity Works Co. The undertaking is primarily based upon the utilisation as fuel of the extensive lignite coalfields at Golpa-Jessnitz, near Bitterfeld, which were originally acquired by the Berlin company in expectation of a prolongation of its concession in Berlin and the intention to transmit power from Bitterfeld for distribution in Berlin. But before the Berlin Municipal Council recently resolved to take over the undertaking of the Berlin electricity works next October, it had been decided on national grounds to devote the lignite fields in question, which cover a superficial area of over 2,500 acres, affording an adequate quantity of fuel for the projected station for a period of 30 years, to the realisation, indirect as it is, of the scheme for the fixation of nitrogen. The fields are owned by the Golpa-Jessnitz Co., which, in turn, is controlled by the Berlin company, which will possess the whole of the former's capital on the receipt from the Berlin municipality of the amount of the purchase price for the Berlin undertaking next October. As for the scheme itself, it appears that the Golpa-Jessnitz Co. has concluded a contract with the Bavarian Nitrogen Works Co., whereby the former has agreed to supply the latter with energy at a pressure of 80,000 volts for a period of fifteen years, the purchaser having the right to extend the contract for a further ten years on the same conditions, which are not disclosed, but which are reported to represent a price as low as 1 pfennig (·125d.) per KW.-hour, owing to the exceptionally favourable conditions for working the lignite deposits. On its part the purchasing company has undertaken to accept delivery of 500,000,000 KW.-hours per annum. It is intended to erect for this purpose a generating station for an output of 180,000 KW., divided among eight units each of 22,500 KW., of which four sets are said to be already under construction and are to be brought into operation by the end of the present year. The second batch of four machines is to serve for supplying undertakings similar to the Bavarian company, which are to be established near Bitterfeld, and the total output will then reach 1,000,000,000 KW.-hours per annum. The electro-chemical plant for the Bavarian company is also in course of construction, so as to be ready when the four sets of generating machinery at Bitterfeld are brought into use. In this way the Germans hope to be able to meet the entire home demand for explosives and fertilisers in conjunction with the large extensions of plant for the production of synthetic ammonia which are in progress at the Baden Aniline works, and which are also to be completed by the beginning of 1916.

Aluminium Solder.—A new aluminium solder, known as the A B C, has lately been introduced by PROCTOR'S GARAGE, LTD., of Parliament Buildings, Orchard Street, Westminster, and Tontine Street, Folkestone. The solder is stated to be the result of a long series of experiments, its success being due not only to the ingredients used, but also to the special method of mixing, which ensures the quality being always reliable and free from variation. It is claimed that the solder can be used equally well for either the oxy-acetylene or ordinary tinsmith's process, provided the simple instructions given in a leaflet sent out by the company are followed.